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FOURTEENTH ANNUAL REPORT

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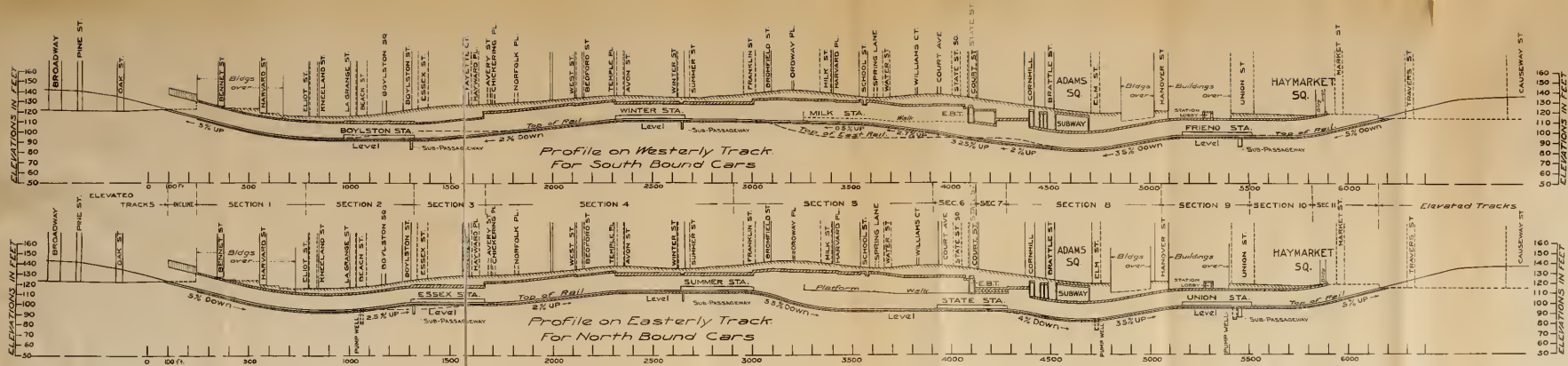
BOSTON TRANSIT COMMISSION

FOR THE YEAR ENDING

JUNE 30, 1908

770





GEORGE G. CROCKER } Chairman
 GEORGE F. SWAIN }
 HORACE G. ALLEN } COMMISSIONERS
 JOSIAH QUINCY }
 THOMAS J. GARGAIN }

HOWARD A. CARSON, Chief Engineer

Note.- Datum is about 100 ⁵⁴/₁₀₀ feet below mean low water of the sea



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FOURTEENTH ANNUAL REPORT

OF THE

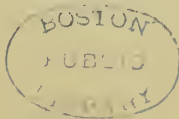
BOSTON TRANSIT COMMISSION,

FOR THE YEAR ENDING

JUNE 30, 1908.



BOSTON
E. W. DOYLE, PRINTER
185 Franklin Street
1909



Repl.

Sup 6355. 4
Vol. 14

Estate of James B. Taylor
December 30, 1949

BOSTON TRANSIT COMMISSION.

15 BEACON STREET, BOSTON, June 30, 1908.

TO THE CITY COUNCIL OF THE CITY OF BOSTON:

In compliance with Statutes of 1894, chapter 548, section 24, the report of the Boston Transit Commission for the year ending June 30, 1908, is respectfully submitted.

WASHINGTON STREET TUNNEL.

The principal construction work of the Washington street tunnel has been completed; the work remaining to be done comprises tiling, plastering and general details of finish, the completion of the tunnel under the Relief Station of the City Hospital, and making changes in the Tremont street subway to re-adapt it to the use of surface cars.

Details of the work of the year will be found in the report of the Chief Engineer.

Advertising.

In the lease of the Tremont street subway, the lessee was prohibited from placing therein or attaching thereto, except as otherwise specified, any structures, machinery, merchandise, apparatus, advertisement or property of any sort not necessary or proper for the operation of its railway therein and the performance of its agreements in the lease contained, but, to the extent of the powers of the Commission and the charter rights of the Company, was authorized to place and maintain upon each platform booths of suitable size and character for the sale of newspapers, magazines, periodicals and books.

The act under the provisions of which the Washington street tunnel is being constructed (St. 1902, Ch. 534), unlike the subway act of 1894, instructed the Commission to contract with the Company for the sole and exclusive use of the tunnel not only for the running of trains and cars therein, but also for such other uses and upon such provisions and conditions, not affecting the term or rental, as the Commission and the

Company might agree upon, or in case of difference as the Board of Railroad Commissioners might determine.

Under the authority thus given, the following clause was incorporated in the contract:

To the extent of the power of the company so to do and the power of the commission to contract therefor, the company may place and maintain in the premises booths for the sale of newspapers, magazines, periodicals and books, and in places specially adapted therefor may place or admit unobjectionable advertisements, and may make such other uses of the premises, not impairing the use for transportation of passengers, as the board [of Railroad Commissioners] may from time to time approve; provided however that such booths and advertisements shall not be so placed or used as to diminish or impair the safety, accommodation, convenience or comfort of passengers using the premises; and the company agrees that upon receipt of notice in writing at any time or from time to time from the board [of Railroad Commissioners] that in its opinion any of the uses above referred to or approved, either in whole or in part, in any way diminish or impair such safety, accommodation, convenience or comfort or conflict in any way with the best interests of the public, it will forthwith to the extent specified in the notice discontinue such use.

The Commission has assigned locations for advertising spaces of regular shape and placed at regular intervals on the walls of the tunnel below the reservation for station signs. Such spaces have also been assigned in the entrance and exit corridors.

Takings of Real Estate and Easements and Settlements for the Same.

On July 16, 1907, the property at the southerly corner of Winter and Washington streets, belonging to the Municipal Real Estate Trust, was taken for an entrance to and exit from that platform for southbound cars which extends from Winter street to Temple place. Settlement for this property was made June 11, 1908. This property has been leased (the lease being recorded in the Registry of Deeds for the County of Suffolk, book 3232, page 468) to William Filene's Sons Co. for a term of three and a half years from September 1, 1907, with the privilege of an extension for ten years. (See Appendix A.)

On August 15, 1907, a taking was made of an easement for an exit from and entrance to the tunnel in the easterly end of the Winthrop building, on Devonshire street between Water street and Spring Lane. This taking has been settled for.

On September 12, 1907, a taking was made of the property at the northerly corner of Washington and Summer streets, be-

longing to the estate of E. E. Salisbury, for an entrance to and exit from that platform for northbound cars which extends from Summer street to Franklin street. This estate has not been settled for. Litigation is pending, brought by the lessee of the property, who contests the power of the Commission to take the whole estate. That the Commission had such power is not disputed by the owner of the property.

Much time has been devoted to the consideration of claims for damages on account of previous takings of real estate and of easements therein. Among the more important settlements of such claims are those with Charles H. Dill, 2nd, for an estate on La Grange street and with H. W. Suter et als. for easements in the estate Nos. 18-40 Washington street, known as the Green Dragon estate, and with David P. Kimball for easements in the estate No. 44 Washington street.

Right of Relocation.

It became necessary to order a relocation of a manhole of the Edison Electric Illuminating Company in Winter street, and under the authority given by the statutes the Commission granted a new location for such manhole which encroached upon the area under the northerly sidewalk on Winter street.

The owners of the premises objected to this relocation and sought relief from the courts, and the right of the Commission was upheld by the Superior Court in the case of Sarah H. Swan et al. *v.* Edison Electric Illuminating Company. (See Appendix B.)

CONNECTION BETWEEN THE TREMONT STREET SUBWAY AND THE EAST BOSTON TUNNEL.

In the Tremont street subway there is not now and never has been any crossing of tracks at grade.

In January, 1906, this Commission having been instructed by the Legislature to inquire into and report on the subject of the further development of the subway systems of the city of Boston, incorporated in its report the following statement in relation to the proposed connection of the East Boston tunnel tracks with those in the subway:—

The original act, authorizing the construction of the East Boston tunnel (St. 1897, c. 500,) as interpreted by the court, required the Boston Transit Commission, at some point within the limits therein defined, to make a connection between the tracks of the tunnel and the tracks of the

subway. By St. 1902, c. 114, passed at the instance of this commission, it was provided that the East Boston tunnel and the Cambridge Street subway might be connected with the existing subway, and with each other, and with any other subway, on such terms, in such manner and at such points, whether at grade or otherwise, as the Boston Transit Commission might deem that the public interests require; but it was further provided that this could only be done with the consent of the Boston Elevated Railway Company. The purpose of the commission in seeking the passage of this act was to get authority to carry the tunnel tracks to a station under the present Scollay Square station. The Boston Elevated Railway Company did not consent thereto. The commission was therefore forced to construct the East Boston tunnel under the provisions of the original act, and to connect its tracks with those of the present subway. The result is, that when the train service is transferred to the Washington Street tunnel and the through tracks in the subway are restored to the use of surface cars, west-bound cars coming through the East Boston tunnel will cross at grade the track for north-bound cars in the subway.

This will reduce the capacity of the two tracks involved in the crossing. More than this, inasmuch as in a double-track system the number of cars passing in each direction is the same, this crossing at grade will reduce the capacity of the whole East Boston tunnel system and of the subway tracks north of Scollay Square. The volume of traffic may ultimately be such as to make it desirable to alter the section of the East Boston tunnel from the Old State House to Scollay Square, so that the tracks will not connect with the tracks in the subway, but will reach a station under the Scollay Square station, with a loop at that point around which the cars can pass for the return trip. Under this arrangement each track in the East Boston tunnel will be able to carry the full traffic which any track can carry, and the through tracks in the subway for their whole length will also have their full traffic capacity.

So long as the north-bound traffic at Scollay Square is split into two parts, one being the North Station traffic and the other the East Boston tunnel traffic, the sum of these two parts will not exceed 240 cars per hour; while if the suggested change is made, it will be possible to run 240 cars per hour to the North Station and also 240 cars per hour to East Boston, so that the sum of the two lines would then be 480 cars per hour.

There having been no further legislation in relation to this matter the Commission, as in duty bound, is now proceeding to make provision for the connection between the East Boston tunnel tracks and those in the subway. As above explained this will result in a crossing at grade.

EAST BOSTON TUNNEL.

Toll Receipts.

The following is a statement of the receipts from tolls and the cost of collection of the same for the year ending June 30, 1908:

July 1, 1907, to July 31, 1907:		
Receipts	\$10,346.01	
Cost	1,488.98	
Net		\$8,857.03
Aug. 1, 1907, to Oct. 31, 1907:		
Receipts	\$31,061.78	
Cost	4,273.95	
Net		26,787.83
Nov. 1, 1907, to Jan. 31, 1908:		
Receipts	\$32,659.28	
Cost	4,704.15	
Net		27,955.13
Feb. 1, 1908, to April 30, 1908:		
Receipts	\$34,731.79	
Cost	4,673.84	
Net		30,057.95
May 1, 1908, to June 30, 1908:		
Receipts	\$21,140.44	
Cost	2,977.21	
Net		18,163.23
Total		<u>\$111,821.17</u>

Cost includes wages, cost of exit tickets, cost of entrance tickets, power for lighting and heating, cost of necessary accounting, proportion of indemnity insurance premiums on bonds of collectors, toll collectors and ticket sellers.

The Boston Elevated Railway Company paid in rentals in 1907, \$51,371.09, being according to the statute three-eighths of one per cent. of its gross receipts for one year.

SUBWAY.

Payment of Rental under the Toll System.

In accordance with that clause of the lease of the subway which provides that if in any one quarter the amount which the Company would pay for rental, reckoned on a stated toll for each car, should exceed the amount reckoned on the basis of four and seven-eighths per cent. of the cost, the Company shall pay such excess, the following was received:

CITY OF BOSTON.
COLLECTING DEPARTMENT.
CITY HALL.

BOSTON, Oct. 18th, 1907.

B. LEIGHTON BEAL, ESQ., *Secretary, Rapid Transit Commission, 15 Beacon St., Boston, Mass.*

DEAR SIR:—There was deposited in this department for collection on October 18th, 1907, a bill against the Boston Elevated Ry. Co., for additional amounts due for use of the Subway for the year ending Sept. 30, 1907; said amounts being in excess of the charges for rentals rendered on bills against said corporation, rendered, Dec. 31, 1906, and Mar. 31, June 30 and Sept. 30, 1907, by the Boston Transit Commission.

This bill was paid Oct. 18th, 1907, and the amount, \$13,163.71 was credited to Rent of Subway, Interest and Sinking Fund.

Yours respectfully,
(Signed) GARRETT W. SCOLLARD,
City Collector.

The payments previously made amounted to \$19,961.79, making a total of \$33,125.50 thus far paid on account of the operation of the toll clause.

RIVERBANK SUBWAY.

Notice was received from the Boston Elevated Railway Company on July 26, 1907, that that Company had accepted chapter 573 of the acts of that year for the construction of an east and west tunnel and subway to be called the Riverbank subway.

Three general schemes were considered for the location of this subway in the Charles river embankment; one a location on the outer or water side of the embankment and below the overflows of the marginal conduit; one on the inner or Back street side of the embankment above the sewer connections with the marginal conduit, and one on the inside of the embankment below such sewer connections. Under the second plan, unless the sewer connections are siphoned, the top of that part of the embankment over the subway would be about eight feet above the level of Back street.

Various conferences were held with property owners and their representatives, and it was decided that the Riverbank subway, so far as it lies in the Charles river embankment, be located between Back street and the marginal conduit, with siphoned sewer connections below it and storm overflows above it.

Under the act the Commission was required to give a public hearing before determining upon the westerly terminus of the subway and its approaches and connections. In

accordance with this provision public hearings were given on Thursday, October 24, and Tuesday, October 29, 1907. These hearings were advertised and special notice of them was sent to the owners of property immediately affected. The hearings were largely attended. Every plan that was proposed met with objection.

Three plans deserve special mention. One provided for continuing the subway underneath the Stony Brook outlet at the Charlesgate and for bringing it to the surface at the junction of Commonwealth avenue and Beacon street. The second plan provided for bringing it to the surface between Harvard bridge and Charlesgate East, the tracks from that point being carried on the surface through Charlesgate East to Beacon street. This involves two right-angle turns, one at the exit from the subway and another in passing from Charlesgate East to Beacon street. The third plan provided for bringing the tracks to the surface between Harvard bridge and Charlesgate East and carrying them thence on the surface diagonally across the Stony Brook outlet into Beacon street beyond Charlesgate West.

The opinion of the Corporation Counsel having been asked as to the right of the Commission to make use of Commonwealth avenue for the incline, his opinion in writing was given and will be found as Appendix C.

On Feb. 13, 1908, the Commission voted that the westerly incline be located "In the embankment between Massachusetts avenue and Charlesgate East."

By Statutes 1907, chapter 573, section 16, it was provided that the construction of the Riverbank subway should be begun at such time, after the expiration of one year from the completion of the Washington street tunnel, as the Commission and the Company might agree upon, or, in case of difference, as the Board of Railroad Commissioners should determine that the public interest required, but authority was given to begin construction at any time which the Commission and the Company might agree upon.

On Feb. 18, 1908, the Commission voted that it was expedient to begin the construction of the Riverbank subway at once and that the Boston Elevated Railway Company be asked if it would agree with the Commission as to the advisability of so doing.

The Company made reply as follows:

BOSTON ELEVATED RAILWAY CO.
PRESIDENT'S OFFICE.
101 MILK ST.

BOSTON, MASS. Feb. 24th, 1908.

Boston Transit Commission, 20 Beacon St., Boston.

DEAR SIR:—In response to the vote of inquiry contained in your communication of February 18th, current, as follows, "voted, that the Boston Elevated Railway Company be asked if it will agree with the Commission as to the advisability of such immediate construction, (of the Riverbank Subway,) in accordance with the provisions of Section 16, chapter 573, Acts of 1907," we have to say that we are unable to agree with your Honorable Commission as to the advisability of the immediate construction of the Riverbank Subway.

The Act clearly contemplated the possibility of conditions which would prevent us from agreeing to an early construction of the Riverbank Subway, and such conditions we are now meeting.

A year ago, when the proposition to build such a subway was under consideration, the cost was estimated at considerably below that which we understand your engineers now consider probable,—namely, \$3,700,000. This is partly due to the fact that you have found it desirable that the subway shall be built below the sewer connections, instead of on the surface of the river-bed.

We do not feel that we ought to undertake burdens beyond our power; in other words, we should not make extensions until we are reasonably sure that our revenue is adequate to support them.

Moreover, we think it highly expedient that the effect of the opening of the Washington Street Tunnel upon the Boylston street congestion be observed before the Riverbank Subway is constructed. Much relief from the conditions on Boylston street is expected when the tunnel is in use, and that will be in the not distant future.

Respectfully,

(Signed)

WM. A. BANCROFT,
President.

CONGESTION OF TRAFFIC.

By Chapter 247 of the acts of the Legislature for the year 1907 this Commission was instructed to investigate the congestion and delay of teaming traffic and of the movement of freight within the city of Boston, to consider whether such congestion and delay can be relieved by the construction of subways for the transfer of freight and to report its conclusions and recommendations to the General Court not later than Jan. 10, 1908.

The Commission, through correspondence with the leading officials of the principal cities in the United States and in Europe, and through information received by the courtesy of the consular department, obtained a mass of material showing a great variety of conditions and the treatment thereof. The Commission also made an investigation as to the amount and direction of freight teaming in the city, studied the problem in many aspects, and under date of Jan. 10, 1908, made a report to the Legislature, which will be found in Appendix D.

An appropriation of \$5,000 was made by the City Council to meet the expense of this investigation. The expenditure by the Commission amounted to \$3,015.92.

EIGHT-HOUR LAW.

On Sept. 21, 1906, John B. Moran, Esq., District Attorney of Suffolk County, charged that the Commission had committed an offense against the eight-hour law, which went into effect on June 22 of that year (Acts of 1906, c. 517,) in connection with a contract which he alleged the Commission had made for the printing of its annual report. All of the information in the possession of the Commission or its Secretary was given to the District Attorney and on November 15, 1906, an indictment against Messrs. Crocker, Swain and Allen, of the Commission, was returned in the Superior Criminal Court for Suffolk County. The defendants were arraigned, pleaded not guilty, and on April 8, 1908, the indictment was tried. At the close of the Government case the presiding judge ordered the jury to return a verdict of "Not Guilty," which was done.

SINKING FUNDS.

The following is the condition of the debt and of the sinking funds for the various divisions of the work of the Commission at the date of this report, as stated by the City Treasurer:

SUBWAY (INCLUDING ALTERATIONS:)

(Debt, \$4,416,000 *outside debt limit.*)

Amount of fund, July 1, 1907	\$947,600.21
Interest on bank deposits, July 1, 1907, to date	\$975.12
Interest on investments, July 1, 1907, to date	26,046.67
Revenue, etc., July 1, 1907, to date	65,150.95
	92,172.74
	\$1,039,772.95

CHARLESTOWN BRIDGE, No. 1.

(Debt, \$750,000, *inside debt limit.*)

Amount of fund, July 1, 1907	\$136,003.57
Interest on bank deposits, July 1, 1907, to date	\$156.97
Interest on investments, July 1, 1907, to date	2,826.69
Requirement for debt	8,550.00
	11,533.66
	\$147,537.23

BOSTON TRANSIT COMMISSION.

CHARLESTOWN BRIDGE, No. 2.

(Debt, \$805,000, outside debt limit.)

Amount of fund, July 1, 1907		\$167,099.59
Interest on bank deposits, July 1, 1907, to date	\$193.62	
Interest on investments, July 1, 1907, to date	4,698.00	
Revenue, etc., July 1, 1907, to date	1,075.00	
Requirement for debt	7,583.00	
		<u>13,549.62</u>
		<u>\$180,649.21</u>

EAST BOSTON TUNNEL.

(Debt, \$3,193,000, outside debt limit.)

Amount of fund, July 1, 1907		\$128,416.29
Interest on bank deposits, July 1, 1907, to date	\$534.69	
Interest on investments, July 1, 1907, to date	3,115.00	
Revenue, etc., July 1, 1907, to date	50,896.00	
		<u>54,545.69</u>
		<u>\$182,961.98</u>

BOSTON TUNNEL AND SUBWAY.

*(Washington Street Tunnel.)**(Debt, \$7,956,700, outside debt limit.)*

Amount of fund, July 1, 1907		\$72,045.26
Interest on bank deposits, July 1, 1907, to date	\$176.20	
Interest on investments, July 1, 1907, to date	2,070.83	
Revenue, etc., July 1, 1907, to date	29,040.89	
Premium, sale of bonds	128,800.00	
		<u>160,087.92</u>
		<u>\$232,133.18</u>

RIVERBANK SUBWAY.

(Debt, \$5,000, outside debt limit.)

No fund.

AMOUNTS PAID FOR RENTAL OF THE SUBWAY.

The following sums have been paid during the year by the Boston Elevated Railway Company for the use of the subway:

Sept. 30, 1907:		
Net cost of subway	\$4,100,551.35	
One quarter's rental		\$49,975.47
Alterations: net cost	242,673.93	
One quarter's rental		2,957.59
Dec. 31, 1907:		
Net cost of subway	4,100,551.35	
One quarter's rental		49,975.47
Alterations: net cost	242,673.93	
One quarter's rental		2,957.59
March 31, 1908:		
Net cost of subway	4,100,551.35	
One quarter's rental		49,975.47
Carried forward		<u>\$155,841.59</u>

<i>Brought forward</i>		\$155,841.59
Alterations: net cost	\$242,673.93	
One quarter's rental		2,957.59
June 30, 1908:		
Net cost of subway	4,100,803.47	
One quarter's rental		49,978.54
Alterations: net cost	242,673.93	
One quarter's rental		2,957.59
		<u>\$211,735.31</u>
Received on toll account		<u>13,163.71</u>

STATEMENT OF EXPENSES.

The following is a classified statement of the expenses of the Commission for the year ending June 30, 1908:

SUBWAY.

SECTION EIGHT.

Field supplies	\$252.12	\$252.12
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EAST BOSTON TUNNEL.

ENGINEERING DEPARTMENT.

Rooms—Supplies	\$75.27	
Stationery and printing	225.00	
Skilled service	16.93	
	<u> </u>	317.20

MISCELLANEOUS.

Legal and expert advice	\$12.00	
Labor	64.34	
Field supplies	231.39	
Teaming	2.90	
	<u> </u>	310.63

SECTION A.

Labor	\$26.92	
	<u> </u>	26.92

SECTION B.

Construction	\$188.10	
Field supplies	78.65	
Labor	6,590.53	
Office supplies	13.26	
Skilled service	82.49	
Teaming	9.05	
	<u> </u>	6,962.08

SECTION C.

Field supplies	\$4,469.27	
Labor	503.18	
Legal and expert advice	860.00	
Teaming	4.14	
	<u> </u>	5,836.59
<i>Carried forward</i>		<u>\$13,705.54</u>

Brought forward \$13,705.54

SECTION D.

Skilled service \$18.00
18.00

SECTION F.

Construction \$18.03
Field supplies 39.23
Labor 289.09
Legal and expert advice 50.00
Teaming 6.90
403.25

BOSTON TUNNEL AND SUBWAY.

General Expenses:
Office—Furniture \$32.50
Lighting 75.70
Printing 1,490.00
Rental 3,000.00
Repairs 8.15
Stationery-supplies 555.01
Telephone-telegraph 132.50
Stenographers 2,967.79
Messenger 936.00
Clerks 990.00
Salaries of Commissioners and Secretary 28,500.00
38,687.65

ENGINEERING DEPARTMENT.

Rooms—Fuel \$56.89
Furniture 26.38
Lighting 688.37
Printing 1,947.76
Rental 3,333.32
Repairs 23.99
Stationery-supplies 1,786.64
Telephone-telegraph 289.36
8,152.71

MISCELLANEOUS.

Advertising \$104.49
Borings:
Materials 14.57
Chief Engineer 12,000.00
Damages 500.00
Field office, use of 785.95
Field supplies 1,341.72
Inspection 86.25
Instruments 256.27
Insurance 100.00
Messengers 2,380.05
Legal and expert advice 860.00
Skilled service 47,324.41
Stenographers 3,487.53
Teaming 782.70
Testing 5,122.59
Tools 823.57
Water pipes 35.45
Carried forward \$76,005.55 \$60,967.15

<i>Brought forward</i>	\$76,005.55	\$60,967.15
Credits:		
(Transferred to various sections.)		
Labor	\$32,743.75	
Stock	37,046.95	69,790.70
		6,214.85

SECTION ONE.

(From westerly side of Ash street opposite Nassau street to a point in Washington street near southerly side of Eliot and Kneeland streets.)

Advertising	\$6.00	
Construction	2,261.06	
Damages	19.80	
Field supplies	116.18	
Labor	1,783.48	
Lighting	241.76	
Paving	134.52	
Legal and expert advice	250.00	
Protection of tenants	10.01	
Skilled service	135.35	
Teaming	13.80	
Tools	4.60	
		4,976.56

SECTION TWO.

(From near the southerly side of Eliot and Kneeland streets to near the northerly side of Boylston street.)

Patrick McGovern (Contract No. 221)	\$2,338.97	
Alterations	2.52	
Boylston street station:		
Chas. R. Gow Co. (Contract No. 311)	22,525.70	
Miscellaneous	19,505.77	
Construction	5,457.69	
Field supplies	8.77	
Labor	1,979.88	
LaGrange street station:		
Miscellaneous	6,914.70	
Lighting	250.25	
Paving	587.07	
Property damages: Takings	220,880.25	
Skilled service	1,428.22	
Stationery-supplies	2.95	
Teaming	23.67	
Tools	7.10	
Water pipes	1,238.09	
		283,151.60

SECTION THREE.

(From near the northerly side of Boylston street to about 30 feet north of the northerly side of Hayward place.)

Alterations	\$133.14	
Construction	3,241.12	
Damages	5,500.00	
Essex street station:		
Hugh Nawn Contracting Co. (Contract No. 283)	3,475.58	
Miscellaneous	18,294.79	
Field supplies	13.49	
<i>Carried forward</i>	\$30,658.12	\$355,310.16

<i>Brought forward</i>	\$30,658.12	\$355,310.16
Hayward place station:		
Chas. R. Gow Co. (Contract No. 315)	10,515.15	
New England Structural Co. (Contract No. 312)	2,723.00	
Miscellaneous	11,664.28	
Labor	1,613.80	
Lighting	360.10	
Skilled service	1,277.71	
Stationery supplies	6.30	
Teaming	13.32	
Tools	5.47	
Water pipes	5,211.24	
	\$64,048.49	
Credits:		
Hugh Nawn Contracting Co. (Contract No. 243)	\$833.34	
Property damages:		
Takings (transferred to Section Two)	25,583.33	
	26,416.67	
		37,631.82

SECTION FOUR.

(From about 30 feet north of Hayward place to about 50 feet south of Franklin street.)

Alterations	\$85.60	
Construction	6,231.98	
Damages	500.00	
Field supplies	21.73	
Insurance	328.80	
Labor	5,594.20	
Lighting	362.67	
Paving	257.30	
Property damages: Takings	680,043.59	
Skilled service	2,923.11	
Stationery supplies	14.19	
Summer street station:		
Hugh Nawn Contracting Co. (Contract No. 234)	627.69	
New England Structural Co. (Contract No. 318)	1,561.95	
Patrick McGovern (Contract No. 322)	13,320.99	
Miscellaneous	22,823.49	
Teaming	13.32	
Telephone-telegraph	.50	
Temple place station:		
John E. Palmer (Contract No. 309)	4,428.33	
Miscellaneous	10,118.00	
Tools	5.47	
Water pipes	18,425.94	
Winter street station:		
New England Structural Co. (Contract No. 313)	4,913.52	
Patrick McGovern (Contract No. 316)	25,514.58	
Miscellaneous	16,234.15	
<i>Carried forward</i>	\$814,351.10	\$392,941.98

<i>Brought forward</i>	\$814,351.10	\$392,941.98
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CREDITS.

Hugh Nawn Contracting Co. (Contract No. 234)	\$2,489.90	
Temple place station: Hugh Nawn Contracting Co. (Contract No. 234)	232.21	2,722.11
		811,628.99

SECTION FIVE.

(From about 50 feet south of Franklin street to near Court
avenue.)

Advertising	\$6.48	
Alterations	5.50	
Construction	12,771.90	
Field supplies	1,684.03	
Franklin street station: Patrick McGovern (Contract No. 289)	5,402.21	
Miscellaneous	8,058.54	
Labor	23,930.22	
Lighting	840.73	
Old South Meeting House station: Coleman Bros. (Contract No. 294)	6,576.34	
Miscellaneous	16,908.79	
Paving	6,849.85	
Property damages: Takings	36,640.23	
Rental	20.83	
Skilled service	2,187.51	
Stationery supplies	6.38	
Teaming	1,073.16	
Telephone-telegraph	1.25	
Testing	1.91	
Tools	1,103.27	
Water pipes	11,653.32	
Water-street station: Coughlan & Sheils Co. (Contract No. 319)	3,544.56	
Miscellaneous	2,606.36	
		141,873.37

SECTION SIX.

(From near Court avenue to the north side of the East
Boston tunnel.)

Coleman Bros. (Contract No. 333)	\$1,651.70	
Coleman Bros. (Contract No. 337)	446.09	
Coleman Bros. (Contract No. 348)	1,080.94	
Eastern Bridge & Structural Co. (Con- tract No. 304)	15,576.15	
Patrick McGovern (Contract No. 308)	115,260.04	
Reno Inclined Elevator Co. (Contract No. 346)	4,960.00	
Wm. H. Smith (Contract No. 338)	10,551.09	
Advertising	7.20	
Alterations	2,384.55	
Construction	41,719.05	
Damages	13.15	
Electric conduits	96.00	
Field supplies	1,107.09	
<i>Carried forward</i>	\$194,853.05	\$1,346,444.34

<i>Brought forward</i>	\$194,853.05	\$1,346,444.34
Fuel	26.75	
Inspection	69.32	
Instruments	3.00	
Insurance	10.25	
Labor	14,534.72	
Lighting	509.87	
Paving	715.40	
Rental	402.78	
Skilled service	4,563.46	
Stationery-supplies	64.27	
Teaming	185.02	
Telephone-telegraph	65.01	
Tools	84.63	
Travel	8.00	
Water pipes	2,787.58	
		218,883.11

SECTION SEVEN.

(From the north side of the East Boston tunnel to 150 feet north of State street.)

Alterations	\$109.35	
Construction	6,812.40	
Electric conduits	40.80	
Field supplies	463.24	
Fuel	18.12	
Instruments	5.65	
Labor	8,865.37	
Lighting	235.77	
Paving	2,679.51	
Printing	83.15	
Protection of tenants	3.20	
Rental	27.78	
Skilled service	494.64	
Stationery-supplies	22.00	
Teaming	1,040.64	
Telephone-telegraph	10.00	
Testing	.40	
Tools	718.22	
Underpinning	127.90	
Water pipes	495.26	
		22,253.40

SECTION EIGHT.

(From 150 feet north of State street to Hanover street.)

Patrick McGovern (Contract No. 257)	\$20,039.15	
Adams square station:		
Patrick McGovern (Contract No. 284)	1,321.50	
Miscellaneous	1,513.24	
Alterations	724.72	
Construction	5,807.00	
Damages	942.26	
Electric conduits	32.00	
Field supplies	71.59	
Labor	8,865.16	
Lighting	459.56	
Paving	1,563.70	
Portland-street sewer:		
Coleman Bros. (Contract No. 258)	1,757.05	
Miscellaneous	434.70	
<i>Carried forward</i>	\$43,351.63	\$1,587,580.85

<i>Brought forward</i>	\$43,531.63	\$1,587,580.85
Skilled service	367.37	
Stationery-supplies	22.00	
Teaming	163.56	
Tools	143.77	
		44,228.33

SECTION NINE.

(From Hanover street to Haymarket square.)

James J. Coughlan Construction Co. (Contract No. 263)	\$5,748.02	
Alterations	327.64	
Construction	6,227.34	
Damages	644.40	
Electric conduits	425.00	
Field supplies	237.68	
Fuel	5.79	
Insurance	19.00	
Labor	10,796.81	
Lighting	750.81	
Paving	3,071.78	
Legal and expert advice	1,245.00	
Property damages: Takings	105,421.30	
Protection of tenants	105.18	
Rental	27.77	
Skilled service	1,028.73	
Stationery-supplies	26.73	
Teaming	25.10	
Telephone-telegraph	1.15	
Tools	620.57	
Testing	156.51	
Union street station:		
Jas. J. Coughlan Construction Co. (Contract No. 263)	5,256.01	
W. A. Murtfeldt Co. (Contract No. 321)	2,150.94	
Miscellaneous	18,079.49	
Water pipes	358.81	
		162,757.56

SECTION TEN.

(In Haymarket square for a length of about 300 feet, on the easterly side of the old subway.)

Coleman Bros. (Contract No. 269)	\$3,000.00	
Coughlan & Sheils Co. (Contract No. 310)	2,717.00	
Construction	378.14	
Electric conduits	430.00	
Field supplies	59.89	
Fuel	1.24	
Labor	6,045.46	
Lighting	377.46	
Paving	484.70	
Rental	62.49	
Skilled service	240.96	
Teaming	178.72	
Tools	5.58	
<i>Carried forward</i>	\$13,981.64	\$1,794,566.74

<i>Brought forward</i>	\$13,981.64	\$1,794,566.74
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CREDIT.

Water pipes	52.10	
		13,929.54

SECTION ELEVEN.

(From the northerly side of Section Ten to portal of old subway.)

Coleman Bros. (Contract No. 285)	\$690.69	
Coughlin & Sheils Co. (Contract No. 329)	35,680.05	
Eastern Bridge & Structural Co. (Contract No. 327)	1,679.82	
John E. Palmer (Contract No. 351)	4,096.74	
Advertising	42.62	
Alterations	14.00	
Borings	126.67	
Construction	13,086.44	
Field supplies	147.82	
Fuel	21.49	
Inspection	7.47	
Instruments	2.75	
Labor	5,151.10	
Lighting	142.01	
Paving	277.54	
Printing	253.34	
Relief station: Alterations and additions:		
Kendall, Taylor & Co., Architects	2,644.33	
Whitcomb & Kavanaugh	15,976.28	
Miscellaneous	281.43	
Rental	124.99	
Skilled service	1,871.79	
Stationery supplies	71.06	
Teaming	251.33	
Telephone-telegraph	11.80	
Tools	235.70	
		82,889.26

SECTION TWELVE.

(Everything north of the northerly line of the original building of the Relief Station of the Boston City Hospital.)

Chas. R. Gow Co. (Contract No. 330)	\$31,621.54	
Advertising	15.92	
Construction	5,263.01	
Field supplies	29.35	
Instruments	4.00	
Labor	389.17	
Skilled service	662.55	
Stationery-supplies	1.50	
Telephone-telegraph	1.50	
Travers street sub-passageway:		
Miscellaneous	292.96	
		38,281.50
<i>Carried forward</i>		\$1,929,667.04

Brought forward \$1,929,667.04

INVESTIGATION OF CONGESTION OF TRAFFIC, ETC.

Office Expenses:		
Clerks	\$50.00	
Stationery-supplies	6.11	
Stenographers	38.35	-
		<u>94.46</u>
Engineering Expenses:		
Skilled service	\$2,514.58	
Stationery-supplies	179.64	
Stenographers	215.53	
Telephone-telegraph	1.41	
		<u>2,911.16</u>

RIVERBANK SUBWAY.

Office Expenses:		
Printing	\$70.36	
Stationery-supplies	37.30	
Stenographers	10.00	
		<u>117.66</u>
Engineering Expenses:		
Advertising	\$101.38	
Borings:		
Labor	348.34	
Materials	8.08	
Messengers	14.75	
Printing	70.37	
Skilled service	1,009.59	
Stationery-supplies	14.23	
		<u>1,566.74</u>

INTEREST.

Boston Tunnel and Subway	\$193,371.04	
Riverbank Subway	61.51	
		<u>193,432.55</u>
Grand Total		<u><u>\$2,127,789.61</u></u>

SUMMARY.

	From Beginning of work to June 30, 1907.	June 30, 1907, to June 30, 1908.	Total.
Subway — Subway Commission .	\$14,131.16		\$14,131.16
Part of general Expenses .	117,473.24		117,473.24
Engineering and Miscellaneous .	407,475.48		407,475.48
Section One .	239,407.12		239,407.12
Two .	363,605.50		363,605.50
Three .	300,639.36		300,639.36
Three and one half	9,355.70		9,355.70
Four .	469,620.33		469,620.33
Five .	388,894.69		388,894.69
Six .	327,541.86		327,541.86
Seven .	231,504.27		231,504.27
Eight .	95,635.96	\$252.12	95,888.08
Eight and one-half	76,639.47		76,639.47
Nine .	299,452.07		299,452.07
Ten .	254,497.88		254,497.88
Eleven .	270,310.57		270,310.57
Interest .	258,575.60		258,575.60
	<u>\$4,124,760.26</u>	<u>\$252.12</u>	<u>\$4,125,012.38</u>
Transfer to Altera- tions, see 11th report .	4.95		4.95
Total .	<u>\$4,124,755.31</u>	<u>\$252.12</u>	<u>\$4,125,007.43</u>
Alterations — Part of General Ex- penses .	\$28,945.53		\$28,945.53
Section Three .	2,568.26		2,568.26
Four .	163.42		163.42
Five .	30,233.01		30,233.01
Seven .	178,516.16		178,516.16
Nine .	3.00		3.00
Ten .	534.04		534.04
Interest .	1,905.56		1,905.56
Transfer from Sub- way, see 11th re- port .	4.95		4.95
Total .	<u>\$242,873.93</u>		<u>\$242,873.93</u>
Charlestown Bridge: Total .	<u>\$1,570,197.98</u>		<u>\$1,570,197.98</u>

	From Beginning of work to June 30, 1907.	June 30, 1907, to June 30, 1908.	Total.
East Boston Tunnel—Part of General Expenses . .	\$161,010.72		\$161,010.72
Engineering Expenses . .	175,902.18	\$627.83	176,530.01
Section A . .	98,839.69	26.92	98,866.61
B . .	1,360,346.12	6,962.08	1,367,308.20
C . .	485,941.80	5,836.59	491,778.39
D . .	244,727.05	18.00	244,745.05
E . .	188,201.14		188,201.14
F . .	231,829.11	403.25	232,232.36
Interest . .	248,156.88		248,156.88
Total . .	<u>\$3,194,954.69</u>	<u>\$13,874.67</u>	<u>\$3,208,829.36</u>
Boston Tunnel and Subway—Part of General Expenses . .	\$143,317.22	\$38,687.65	\$182,004.87
Engineering Expenses . .	340,799.72	14,367.56	355,167.28
Section One . .	773,776.95	4,976.56	778,753.51
Two . .	342,927.28	283,151.60	626,078.88
Three . .	408,866.68	37,631.82	446,498.50
Four . .	725,275.24	811,628.99	1,536,904.23
Five . .	856,357.41	141,873.37	998,230.78
Six . .	49,989.98	218,883.11	268,873.09
Seven . .	115,585.27	22,253.40	137,838.67
Eight . .	446,529.13	44,228.33	490,757.46
Nine . .	346,165.88	162,757.56	508,923.44
Ten . .	119,764.22	13,929.54	133,693.76
Eleven . .	25,372.33	82,889.26	108,261.59
Twelve . .		38,281.50	38,281.50
Interest . .	220,494.72	193,371.04	413,865.76
Total . .	<u>\$4,915,222.03</u>	<u>\$2,108,911.29</u>	<u>\$7,024,133.32</u>
Investigation of Congestion of Traffic, etc. . .			
Office Expenses . .		\$94.46	\$94.46
Engineering Expenses . .	\$10.30	2,911.16	2,921.46
Total . .	<u>\$10.30</u>	<u>\$3,005.62</u>	<u>\$3,015.92</u>
Riverbank Subway:			
Office Expenses . .		\$117.66	\$117.66
Engineering Expenses . .		1,566.74	1,566.74
Interest . .		61.51	61.51
Total . .		<u>\$1,745.91</u>	<u>\$1,745.91</u>
Grand Total . .	<u>\$14,048,014.24</u>	<u>\$2,127,789.61</u>	<u>\$16,175,803.85</u>

ENTRANCES AND EXITS FOR THE PARK STREET TERMINAL.

Chapter 520 of the Acts of 1906, which authorizes the Boston Transit Commission to construct the Boston connection for the Cambridge Main street subway, permits such connection to terminate either at Scollay square or at Park street subway station. The Commission has selected the latter terminal. The act contains the following clause in section 23:

No additional structures shall be placed above the surface of the common, but in connection with the construction of the tunnel the commission may enlarge, by not more than one third, the width of the existing entrances to and exits from the Park street subway station, and the cost thereof shall be deemed and treated as part of the cost of the tunnel.

The public which will use the Cambridge Main street subway cannot be suitably accommodated by such enlargement of the existing Park street entrances and exits. It will be necessary to furnish other entrances and exits. For convenience of use they should be covered. For safety of use they should be protected at least by a railing or wall. It seems proper that the Legislature should be asked for such legislation as will permit appropriate treatment.

TERM OF THE COMMISSION.

The term of office of the Commission will expire July 1, 1909. It is expected that the Washington street tunnel will be completed this Fall, and that the alterations in the existing subway necessary to readapt it to the use of surface cars and also the opening of a connection between it and the East Boston tunnel can be completed within the year.

It will not be possible within the year to settle satisfactorily all the claims against the city growing out of the construction of the tunnel.

By the Acts of 1906, chapter 520, the Commission was authorized to build the Boston end of what is known as the Cambridge subway. The route of this subway in Boston has been determined upon. Borings, and preliminary plans of terminal at Park street have been made.

By the Acts of 1907, chapter 573, the Boston Transit Commission was authorized to construct the Riverbank subway. As previously set forth in this report, the construction of such a subway under the Act cannot be begun until after

the expiration of one year from the opening of the Washington street tunnel, and then only at such time as the Commission and the Company may agree upon, or in case of difference as the Board of Railroad Commissioners shall determine that the public interests require. (See Stat. 1907, ch. 573, s. 16.)

The report of the Chief Engineer is appended.

GEORGE G. CROCKER,	} <i>Boston Transit Commission.</i>
THOMAS J. GARGAN,	
GEORGE F. SWAIN,	
HORACE G. ALLEN,	
JOSIAH QUINCY.	

REPORT OF THE CHIEF ENGINEER.

BOSTON, June 30, 1908.

GEORGE G. CROCKER, THOMAS J. GARGAN, GEORGE F. SWAIN,
HORACE G. ALLEN, JOSIAH QUINCY, *Boston Transit*
Commissioners.

GENTLEMEN:—I submit herewith my report for the year ending on this date.

WASHINGTON STREET TUNNEL.

The work of the year includes among other operations the following, some of which had been previously begun:

Construction on Section 6, comprising mainly excavation, rough concrete walls, roof and invert of the station under and adjoining the Old State House.

Widening the original Subway on its westerly side in Haymarket square for two additional tracks.

Building tunnel under the City Hospital Relief Station for the additional tracks.

Building an open incline near Canal street for the additional tracks.

Building an extension of the Travers street sub-passageway under the open incline.

Building entrances and exits at Boylston street, Hayward place, Temple place, Winter street, Summer street, the Old South Meeting House and at the junction of Devonshire and Water streets.

Building entrance and exit coverings at the Old South Meeting House, at the junction of Devonshire and Water streets, and in Adams square.

Building station stairways at LaGrange, Essex, Franklin and State streets, at Temple place, and between Washington and Union streets, near Haymarket square.

Surfacing passenger platforms in all stations.

Building ventilation ducts in the tunnel arch near Norfolk place and near Milk street.

Protecting tie-rods, columns and other steel work by concrete casings.

Building buttresses between the high and low level tracks of Section 5.

Building high-level passageway between Milk and State Stations. This will enable passengers to transfer in either direction between the East Boston Tunnel and the south-bound platform of the Washington-street Tunnel.

Installing two of the inclined passenger elevators in the station at the Old State House.

Building toilet rooms, parcel rooms, telephone booths, closets, etc.

Building reinforced concrete and plaster ceilings and cove walls.

Plastering and coating untiled surfaces.

Laying enameled and ceramic tiling in stations and passageways.

Information concerning the foregoing matters is given in the statistical tables (after page 38) and in the pages following said tables.

The work still required for the completion of the tunnel, in addition to the uncompleted items of the foregoing list, includes the following:

Various items of finish, such as tiling, plastering and coating; erecting fences, hand-rails and balustrades for station stairways and Bostwick folding gates at entrances and exits; installing bronze-covered doors in stations, and placing metal grilles over openings. Most of these require detailed drawings and to a considerable extent depend one upon another, and five or six months will be required for their completion.

Installing two single-file elevators at the north side of the station at the Old State House.

Completing the tunnel under the City Hospital Relief Station, building passageway connecting the two platforms of the enlarged station in Haymarket square with the platforms of the Union-Friend Station, and making other changes in the Subway necessary and convenient for the accommodation of surface cars and the transfer of their passengers.

GRADES, CURVATURE, IRREGULARITIES CAUSED BY NARROW AND CROOKED STREETS, ETC.

Before this report is published the trains of cars that now run in the old Subway will be running in the Washington Street Tunnel, and the Subway will be restored to its original use—for surface cars only.

The new Tunnel is much better adapted for trains of cars than the Subway, but it has steep grades at each end in getting down from and up to the elevated structure, and it was necessary to encroach on private land to make the minimum radius of curvature as large as 500 feet.

At one station, between Union and Washington streets, north of Hanover street, on land taken from private owners, two station platforms are opposite each other. In all other cases, on account of the narrowness and crookedness of the street, the positions of the north and south-bound platforms are staggered. This requires a considerable walk in transferring from the East Boston Tunnel to south-bound trains. It also results in some irregularities of appearance, but has the advantage of distributing the traffic along the street better than would be the case if the platforms were opposite each other.

The track on the easterly side is, for various reasons, generally at a different level from that on the westerly side. The platforms vary in width in different parts of their

length because they extend to the property lines, which are irregular and not parallel with the lines of the tunnel. They are, however, of considerable width and height, are long enough for eight-car trains, are practically straight at their outer edges and have at each end, generally, an entrance and an exit. The passageways to and from the Tunnel are not as straight as they would be if they led directly down from the sidewalk, as in the New York subway. The sidewalks in and near Washington street are much too narrow even without such obstruction, and the entrances and exits, therefore, generally lead through private land, although this is the most costly land in the city. The aggregate width of exits and entrances to a single platform is in general more than thirty feet. They are conveniently placed and so numerous that a person at any point between Kneeland street and the northerly end of the Tunnel, wishing to ride either north or south, will not need to go more than one-sixth of a mile to find the proper entrance.

PREVENTION OF ANNOYANCE IN BUILDINGS FROM WASHINGTON STREET TUNNEL NOISE AND VIBRATION.

As a considerable portion of the Washington Street Tunnel lies directly under private buildings experimental study was given to the question of preventing annoyance to the occupants by sound and other vibrations caused by the running of trains. Among the means thought of were: (a) Building the track on separate foundations, like piles or piers, passing through the invert or floor of the tunnel and having little or no connection with said floor; (b) Substituting for the ordinary stone ballast some other support for the track itself, such as concrete made with Portland cement or with asphaltic material.

Consultation on this general subject was had by letters with Mr. A. Mallock, who had made a careful study of vibrations in buildings near the Central London Railway, and directly with Professor C. R. Cross of the Institute of Technology and with Professor George W. Pierce of the Department of Physics of Harvard University, and others.

Mr. Mallock did not expect any benefit to result from the above-named plans. His belief, based on his extended study and experience, was that relief was to be expected almost entirely from having the weight of the trains, as far as practicable,

borne on springs. When trouble occurred on the Central London Railway the non-spring-borne load of the locomotives there used amounted to about eight tons per wheel, while with the motor cars which will run in the Washington Street Tunnel the maximum non-spring-borne load will be only about one and one half tons per wheel.

Among other experiments a radial truck was used, with a non-spring-borne load, revolved by an electric motor on a circular rail, the latter having forms of support (a) and (b) mentioned above. Experiments were also made with standard cars, running on about 200 linear feet of track.



Plate 2. ONE OF THE EIGHT COVERINGS OVER BOSTON COMMON
STAIRWAYS TO SUBWAY.

The relative effects of various experiments were measured directly with the ear; also by observing with a telescope with cross wires the movements of an image on a surface of mercury; with the vibration instrument of Mr. Mallock and with the sound measuring apparatus of Professor Pierce. The information obtained indicated that sound or sensible vibrations coming from the Tunnel were much less likely to be noticed by occupants of buildings than vibrations caused by teams and cars on the surface of the street. It also appeared that the support of ties by means of ordinary stone ballast was nearly or quite as good as any form tried, and accordingly that method has been used in all parts of the Washington Street Tunnel.

SHELTERS OVER STAIRWAYS.

Most of the stairway coverings for Boston subways and tunnels have been designed under the direction of architects of high standing. Examples of these structures are shown by Plates 2 and 3.

For special reasons, however, the Commission in some situations directed that the designs be made under the direction of the Chief Engineer. Of course, where this was done,



Plate 3. COVERING OVER STAIRWAY TO SUBWAY, SCOLLAY SQ., BOSTON.

no architectural merit was expected other than fulfilment of purpose with directness, simplicity and economy. One of these is illustrated by Plate 4. It should be noted that the Commissioners examined all designs, whether made by architects or engineer, and required modification when they deemed it desirable. In the cases illustrated by Plates 2, 3, and 4, and in all others previously built here, the stairway coverings were somewhat distant from other buildings and did not noticeably obstruct the sight to and from them. The stairway in Adams square near Devonshire street and those at the Old South Meeting House are, however, very close to other buildings, and it was deemed important, for legal and other reasons, that there should be as little interference as possible with the sight



Plate 4. COVERING OVER TWO STAIRWAYS TO PLATFORMS OF SUBWAY, HAYMARKET Sq., BOSTON.

to and from them. In order to fulfill this condition most perfectly it was at first proposed that the stairways at these places



Plate 5. OPEN STAIRWAY TO PARIS SUBWAY, RUE DE ROME.

should have *no* coverings, but instead should have only guard rails or fences, like those shown on Plates 5, 6 and 7.

Partial shelters like those on the New York subway at Fulton street, near Broadway, where about half of each stair-

way opening is covered—see Plate 8—were also discussed. The Commission concluded, however, that each stairway must



Plate 6. OPEN STAIRWAY TO BERLIN SUBWAY, WITTENBERG, PLATZ.

be entirely covered over. After various studies had been made by the Engineer, a reinforced concrete structure of the type shown by Plate 9 was adopted by the Commission for the

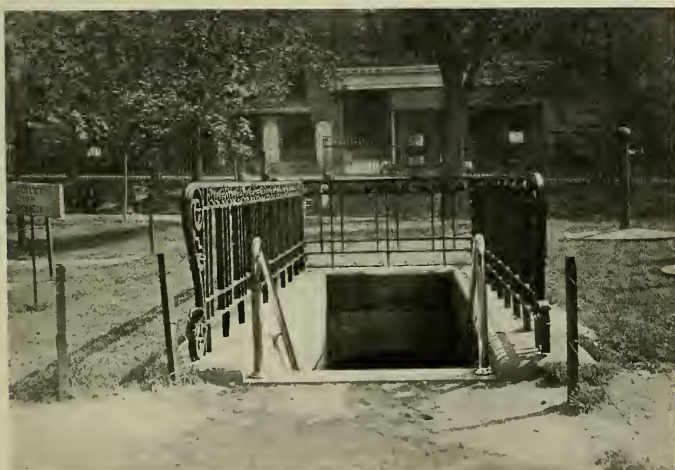


Plate 7. OPEN STAIRWAY TO PUBLIC CONVENIENCE STATION, BOSTON COMMON.



Plate 8. STAIRWAY AT FULTON ST. TO NEW YORK SUBWAY.

Opening in sidewalk is 14 feet long, of which 7 feet, or half the length, is covered, the rest being open to the weather.

coverings at the Old South Church and near Devonshire street in Adams square.

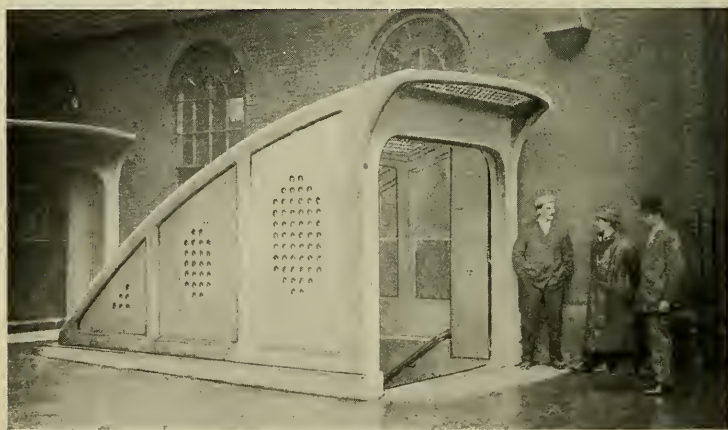


Plate 9. COVERING OVER STAIRWAYS TO WASHINGTON ST. TUNNEL AT OLD SOUTH CHURCH.

The following paragraphs are in reply to critical inquiries concerning coverings like that of Plate 9.

The principal reason why these coverings were not made

of some usual shape, with the lengthwise axis of each roof horizontal instead of being inclined, is that they would have been almost twice as obstructive to sight to and from adjacent buildings as they are now, and thus would have broken a principal requirement. It may further be said that it is not improper for a much used public structure to give indication by its form of its purpose and use, or, in other words, "form should follow function." The main purpose of the thousands of roofs usually seen is to shelter rooms which have horizontal floors, and it is reasonable that the ridge and similar lines of these roofs should be horizontal. The sole purpose of the



Plate 10. COVERING OVER STAIRWAY TO NEW YORK SUBWAY, AT
60TH STREET AND BROADWAY.

roofs in question is to shelter inclined stairways, and it is not unreasonable that these roofs should be inclined. The New York and Budapest coverings, shown by Plates 10 and 11, give indication of stairways descending below the street surface. The covering shown by Plate 9 gives marked indication to the same effect.

The roofs were not made with panes of glass, like most of the subway stairway coverings in Boston and New York or like the marquises at hotel and theater entrances, because the roof-glass in these subway coverings, both in New York and Boston, is disfigured by cracks, and the same is true regarding most of the marquises in Boston. It was therefore deemed

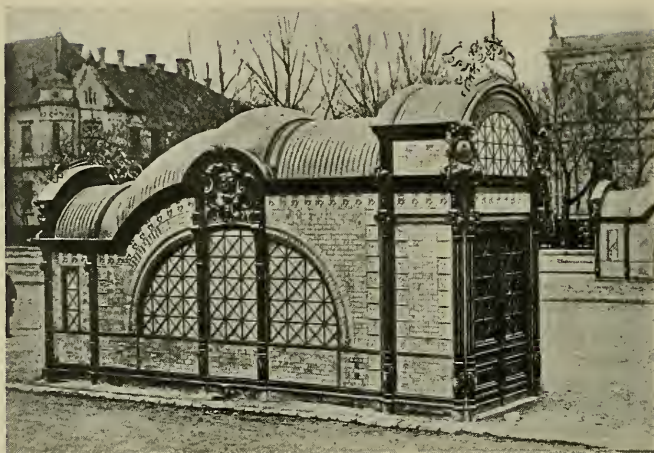


Plate 11. COVERING OVER STAIRWAY TO BUDAPEST SUBWAY,
ARENASTRASSE.

prudent to use sidewalk disk glass. It should be said, however, that in some of the Paris stairway coverings, such for example

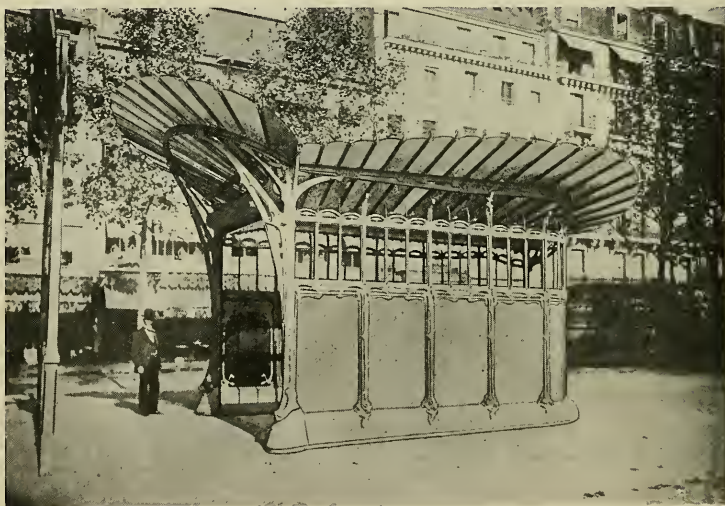


Plate 12. COVERING OVER STAIRWAY TO PARIS SUBWAY, PORTE
MAILLOT.

as that of Plate 12, pane glass has been used which has not cracked.

Edges and corners were rounded, instead of being made

sharp and "crisp" as is usually the case in stone structures, because sharp projecting concrete edges and corners are apt to become defaced by fragments breaking off.

A further answer to this and some other questions is indicated in an article on "Expression in a New Material" in the Architectural Record, New York, April, 1908. According to this article the proper use of concrete construction should be:—

"Distinctly at variance with present-day or traditional form in current use; which form was created in other materials and systems of stability. . . . Conventional form, as it has been handed down to us, is permeated with the feeling of the cutter's tools. One sees this in the straight lines and sharpness of mouldings and in clear-cut carving. Concrete calls naturally for moulded flowing forms growing out of the body material. . . . It will be seen from these tendencies that logical form, as it may be expressed architecturally in concrete, makes for severity and simplicity. . . . The conventional form handed down to us in the motives of articulated stone and timber architecture should be abandoned, root and branch, because entirely without relation to monolithic construction; yet further consideration may convince us that too much radicalism is barren of good results and that we cannot break too suddenly with established ideas."

STATISTICAL TABLES.

Tables 1 to 4, inclusive, contain leading statistical data in regard to the work of the year; for convenience of reference they refer to considerable former work on the Washington-street Tunnel. They are followed by some pages of additional information and explanatory remarks less adapted to tabulation.

Nov. 2.—PROGRESS OF CONSTRUCTION.

Site and Interpretation of Work.	Worked Beginning		Dates of Completion		Amount of Work Done, including previous work.		Total Amount of Work Done, including previous work.		Number of Men Employed for the time being.	
	Excavation	Concrete.	Excavation	Concrete.	Excavation in cu yds.	Concrete in cu yds.	Excavation in cu yds.	Concrete in cu yds.	Day.	Night.
SOUTHERN ENGLAND.	Oct. 6, 1904.	Oct. 11, 1904.	Nov. 2, 1904.	Nov. 4, 1904.	.....	.....	665	480	.....	.....
	Nov. 21, 1904.	Nov. 29, 1904.	June 18, 1905.	June 28, 1905.	.....	.....	11,224	4,624	.....	.....
	Nov. 26, 1904.	Dec. 1, 1904.	July 22, 1905.	Aug. 10, 1905.	.....	.....	20,361	4,427	.....	.....
	Dec. 20, 1904.	Dec. 31, 1904.	Nov. 28, 1905.	Dec. 4, 1905.	.....	.....	19,670	4,554	.....	.....
4	Feb. 20, 1905.	Feb. 28, 1905.	Nov. 28, 1905.	Nov. 28, 1905.	.....	.....	50,327	11,546	.....	.....
5	May 26, 1905.	June 7, 1905.	March 8, 1906.	March 16, 1906.	.....	.....	32,940	13,160	.....	.....
6	April 12, 1907.	April 29, 1907.	Dec. 2, 1907.	Dec. 23, 1907.	9,904	4,601	15,904	6,091	80	75
7	July 16, 1906.	July 16, 1906.	June 1, 1907.	June 29, 1907.	.....	.....	9,215	3,250	.....	.....
8	March 24, 1906.	April 4, 1906.	Nov. 16, 1906.	Nov. 23, 1906.	.....	.....	25,768	10,887	.....	.....
9	May 20, 1906.	June 10, 1906.	Jan. 22, 1907.	Feb. 3, 1907.	.....	.....	20,147	6,381	.....	.....
do, Ticket office.	(Cutting out manure) Feb. 15, 1907.	Feb. 27, 1907.	April 17, 1907.	May 17, 1907.	.....	.....	(Cutting out manure) 170	302	.....	.....
10 (part of)	Aug. 18, 1906.	Aug. 25, 1906.	Dec. 7, 1906.	Dec. 26, 1906.	.....	.....	9,494	2,672	.....	.....
11 (part of)	Nov. 17, 1906.	Jan. 4, 1907.	Jan. 8, 1907.	March 27, 1907.	.....	.....	265	263	.....	.....
Luggage street en- trance and exit.	Jan. 18, 1906.	Jan. 21, 1906.	March 24, 1906.	May 1, 1906.	.....	.....	1,370	512	.....	.....
Baynard place en- trance and exit.	May 28, 1907.	June 2, 1907.	Oct. 7, 1907.	Oct. 21, 1907.	Earth, 947; manure, 313	Earth, 947; manure, 313	673	773	23	22
Temple place en- trance and exit.	May 2, 1907.	May 6, 1907.	May 25, 1907.	July 2, 1907.	.....	.....	15	422	379	12
Winter street en- trance and exit.	July 20, 1907.	Aug. 5, 1907.	Nov. 2, 1907.	Dec. 3, 1907.	2,214	1,166	2,214	1,166	18	15
Summer street en- trance and exit.	Sept. 21, 1907.	Sept. 30, 1907.	Dec. 20, 1907.	Dec. 21, 1907.	830	520	830	520	15	12
Franklin street en- trance and exit.	Jan. 1, 1907.	Jan. 21, 1907.	April 7, 1907.	May 3, 1907.	3,594	1,308	3,594	1,308	.....	.....
Milk Station en- trance and exit.	March 1, 1907.	March 14, 1907.	June 6, 1907.	Aug. 4, 1907.	300	2,152	1,910	20	12	.....
Devonshire street entrance and exit.	Aug. 17, 1907.	Aug. 23, 1907.	Aug. 31, 1907.	Sept. 14, 1907.	82	83	82	83	11	10
Adams square entrance.	Nov. 1, 1906.	Nov. 12, 1906.	Dec. 15, 1906.	Jan. 4, 1907.	.....	.....	1,445	629	30	20
Unlabeled and Station stairways.	.....	Sept. 25, 1907.	.....	Oct. 19, 1907.	61	.....	61	14	.....	.....
Enlargement of St. Pancras street square.	Oct. 5, 1907.	Oct. 19, 1907.	Dec. 15, 1907.	Dec. 28, 1907.	3,853	1,217	3,853	1,217	40	32
Palgrave and St. of Subway under Re- sident Station.	May 12, 1908.	June 2, 1908.	June 23, 1908.	.....	700	388	700	388	15	12
Open Radium, north of Radium Station.	Nov. 2, 1907.	Dec. 22, 1907.	Dec. 13, 1907. March 9, 1908	Feb. 22, 1908.	6,621	1,260	6,621	1,260	40	15
Traverse street sub- passage.	March 30, 1908.	May 22, 1908.	May 11, 1908.	June 12, 1908.	180	137	180	137	10	.....
Tilling, Division and Pass Station.	Sept. 30, 1907.	.....	April 16, 1908.	.....	1024 sq. yds. enameled tiling, 3224 sq. yds. ceramic tile.	1024 sq. yds. enameled tiling, 3224 sq. yds. ceramic tile.	.....	.....	10	.....
Tilling, Winter and Summer Stations.	Dec. 9, 1907.	.....	April 16, 1908.	.....	1046 sq. yds. enameled tiling, 171 sq. yds. ceramic tile.	1046 sq. yds. enameled tiling, 171 sq. yds. ceramic tile.	.....	.....	4	.....
Tilling, Mile Station.	Feb. 4, 1908.	.....	April 11, 1908.	.....	2868 sq. yds. ceramic tile.	2868 sq. yds. ceramic tile.	.....	.....	7	.....
Tilling, State Sta- tion.	Feb. 5, 1908.	.....	.....	.....	696 sq. yds. enameled tiling, 886 sq. yds. ceramic tile.	696 sq. yds. enameled tiling, 886 sq. yds. ceramic tile.	.....	.....	11	.....
Tilling, Union- Friend Station.	Feb. 12, 1908.	.....	.....	.....	453 sq. yds. enameled tiling, 1095 sq. yds. ceramic tile.	453 sq. yds. enameled tiling, 1095 sq. yds. ceramic tile.	.....	.....	18	.....

Location of Well	CHARACTER OF EARTH FOUND IN EXCAVATION	Disposition of Surplus.
SOUTHERLY INCLINE.		
	Below level of basements a stiff blue clay with very little water.	Dumped near junction of Dorchester Ave. and Southampton St., South Boston, a distance of 8000 ft.
Section 1	Upper portion mostly clay and gravel. About four feet from bottom a layer of sand with water; below this a stiff blue clay mixture with very little water.	About 9000 cu. yds. dumped near Dorchester Ave. and Southampton St., a distance of 8000 ft.; balance hauled to scow (7000 ft.) and dumped at sea outside of Boston Light.
Section 2	First seven or eight feet, sand and gravel filling. Below that, yellow or blue clay with some sand; bottom generally soft and wet.	Mostly hauled to dump at Kemp St., South Boston, 8000 ft. distant.
Section 3	In Essex St., first seven or eight feet, sand and gravel filling, then ten feet clay; below that blue clay. In Washington St., mostly to Essex St., sand and gravel filling to ten feet below surface; below that yellow clay and sand. North of Essex St., sand and gravel filling to ten feet below surface, then fourteen feet clay and sand; below this, sharp brown sand. Below thirty feet from surface, considerable water in Washington St.	Jones & Medlan hauled mostly to Commonwealth dump, between B and E streets, South Boston, a distance of 9000 to 1000 ft. The Hugh N. Manning Co. changed to scow, 4000 ft. distant, dumping at sea outside of Boston Light.
Section 4	Filling in first five or six feet, then hard blue clay to ten feet below surface. North of Temple place, below the clay, hard coarse gravel and sand; south of Temple place, fine brown sand. Very little water.	Mostly hauled 2500 ft. to scow and dumped at sea outside of Boston Light.
Section 5	South of Spring Lane, a hard compact mixture of clay and gravel. Between Milk and Franklin streets, east side, a large quantity of water was encountered. North of Spring Lane, a mixture of sand and gravel, without water.	Hauled to scow, 4000 ft. distant, and dumped at sea outside of Boston Light.
Section 6	Mostly sand and gravel; some clay. No water.	Charles River Embankment.
Section 7	Gravel, sand and clay; water at depth of 30 feet below surface.	Charles River Embankment.
Section 8	South of Battle St., mostly sand and gravel, some clay; north of Battle street, mostly clay with a little sand and gravel. Considerable water south of Cornhill at depth of about 30 feet; but little water north of Cornhill.	To scow and out to sea.
Section 9	Below cellar floors stiff blue clay; very little water.	To scow and out to sea. Charles River Embankment.
Section 10 (part of)	For about 8 feet from the surface, sand and gravel filling; then, for about 12 feet, sand and gravel, with silt towards the bottom; then about 3 feet of peat; stiff clay below. Very little water.	To scow and out to sea. Charles River Embankment.
Section 11 (part of)	Same as Section 10.	Charles River Embankment.
Lafayette street entrance and exit.	Stiff blue clay; some water.	To scow and out at sea.
Jaylson street entrance and exit.	Mostly clay; about a foot of sand at bottom, carrying considerable water.	Charles River Embankment.
Essex street entrance and exit.	Below basement floor, blue clay; very little water.	Charles River Embankment.
Hayward place entrance and exit.	Mostly clay, with about 2 feet of sand at bottom, carrying considerable water.	Charles River Embankment.
Temple place entrance and exit.	Fine sand and gravel. No water.	Charles River Embankment.
Winter street entrances and exit.	Filling 7 to 8 feet deep, then hard blue clay; no water.	Charles River Embankment.
Summer street entrances and exit.	Blue clay below basement floor; no water.	Charles River Embankment.
Franklin street entrance and exit.	Sand and gravel; bottom stiff blue clay. Very little water.	Charles River Embankment.
Milk Station entrances and exits	Sand and gravel; no water.	Charles River Embankment.
Devonshire Street entrance and exit.	Stiff blue clay.	Charles River Embankment.
Adams square entrance.	Mostly sand and gravel; some clay. No water.	Charles River Embankment.
Enlarge ment of Subway, Haymarket square.	City dump filling, about one-third; stiff blue clay, two thirds. At northerly end in bottom, a 3 ft. layer of peat, overlying stiff blue clay.	Charles River Embankment.
Enlarge ment of Subway, under Relief Station.	Filling first 13 feet below basement floor. Then 11 feet to 12 feet of peat; hard blue clay below this.	Mostly Charles River Embankment.
Open Incline north of Relief Station.	City dump filling, about two-thirds; gravel filling by Boston & Maine Railroad about one-third.	Charles River Embankment.

No. 4. CONSTRUCTIONAL STEEL WORK.

LOCATION OF WORK

Contractor for Furnishing Steel Work, and Date of Contract.

Amount of Previous Annual Report.

Verifications Showing Previous Annual Report.

Date of Completion Named in Contract.

Date of Certificate of Completion.

Southerly incline.

Harrington, Robinson & Co., Sept. 10, 1904.

\$230.00

Bids filed, but not appended.

Delivered Sept. 30, 1904.

Section 1

N. E. Structural Co., Sept. 9, 1904.

17,600.00

XII, K-9.

Dec. 12, 1904.

Section 2

N. E. Structural Co.,
Boston Bridge Works, Sept. 6, 1904.
Oct. 12, 1904.1,315.26
21,040.00Bids filed, but not appended.
XII, K-11.Nov. 5, 1904.
Mar. 18, 1905.

Section 3

Boston Bridge Works, Nov. 23, 1904.

24,125.00

XII, K-15.

April 14, 1905.

Section 4

Lewis F. Sheenker,
H. P. Converse & Co., Feb. 1, 1905.
Feb. 4, 1905.21,076.00
2,515.94

XII, K-17.

May 5, 1905.

do. (additional.)

N. E. Structural Co., May 9, 1905.

675.00

not appended.
XII, M.

May 17, 1906.

Section 5

F. A. Romlette & Son, May 31, 1905.

11,124.55

XII, K-22

Sept. 22, 1905.

Section 6

Eastern Bridge & Structural Co., Feb. 28, 1907.

13,604.40

XIII, R.

June 15, 1907.
July 13, 1907.
July 26, 1907.

Section 7

H. P. Converse & Co., Mar. 9, 1907.

1,987.30

Bids filed, but not appended.

May 2, 1907.

Sections 7 and 8

N. E. Structural Co., Feb. 14, 1906.

7,764.00

XIII, E.

May 11, 1906.

Section 9

N. E. Structural Co., Mar. 7, 1906.

28,275.00

XIII, I.

July 27, 1906.

do. (Ticket Office.)

H. P. Converse & Co., May 8, 1906.

2,200.00

XIII, L.

Sept. 19, 1906.

Section 10

N. E. Structural Co., June 8, 1906.
Aug. 3, 1906.11,213.64
5,340.50

XIII, O.

Oct. 21, 1906.
Nov. 9, 1906.

Section 11

Boston Bridge Works, Aug. 31, 1906.

1,734.60

Bids filed, but not appended.

Dec. 7, 1906.
Jan. 30, 1907.

LaGrange street entrance and exit.

N. E. Structural Co., Sept. 13, 1906.

6,269.20

Bids filed, but not appended.

Feb. 16, 1906.

Poplston street entrance and exit.

Boston Bridge Works, April 27, 1907.

460.56

XIII, V.

May 8, 1907.

Hayward place entrance and exit.

N. E. Structural Co., May 29, 1907.

2,185.00

XIII, W.

June 25, 1907.

Temple place entrance and exit.

N. E. Structural Co., Jan. 28, 1907.

3,173.12

XIII, O.

Feb. 27, 1907.

Winter street entrances and exit.

N. E. Structural Co., May 27, 1907.

3,766.00

XIII, U.

July 1, 1907.

Summer street entrances and exit.

N. E. Structural Co., Aug. 6, 1907.

1,320.25

XIV, G.

Sept. 13, 1907.

Franklin street entrance and exit.

H. P. Converse & Co., Dec. 5, 1906.

2,344.75

XIII, L.

Feb. 10, 1907.

Milk Station entrances and exits.

N. E. Structural Co., Jan. 28, 1907.

1,800.00

XIII, P.

Feb. 16, 1908.

Enlargement of Subway Hyamarket station.

Eastern Bridge & Structural Co., Sept. 25, 1907.

1,800.00

XIV, L.

Nov. 20, 1907.

Enlargement of Subway way under Relief Station.

American Bridge Co., April 25, 1908.

11,173.95

XIV, EE.

June 20, 1908.
Aug. 22, 1908.

Section 6 of the Washington Street Tunnel.

The structural design of this section was described on page 29 of the last annual report. The platform for north-bound trains therein referred to is at a depth of 36 feet or more from the surface of Washington street, in order that the cars may pass under the East Boston Tunnel. Accordingly, besides the usual stairways for reaching the surface, provision was made for inclined elevators (see following page) which, with the passageways to the platforms of the East Boston Tunnel and Milk St. Station, made the construction more complicated than that on other parts of the tunnel. The work involved supporting the Old State House and the East Boston Tunnel.

Following the past practice of the Commission, the work of construction was so managed as not to interfere with vehicular and passenger traffic on the street surface, which was very heavy at this point.

Details of Construction.—After the underpinning of the buildings and the construction of the side walls had been completed, most of the arch in Washington street was built. The core was next excavated and hoisted to the surface through openings left in the arch, and the invert was then put in place. While this part of the work was in progress, operations were carried on in State street and under the Old State House. The walls of the building were temporarily supported on steel beams spanning the excavation until the steel columns and girders for its permanent support were erected and the foundations pinned up from them. Work on the passageways and stairways then proceeded, after which the basement of the building was restored. The invert of the East Boston Tunnel was reconstructed without interfering with the movement of cars, and the structure permanently supported on girders resting on steel columns.

The delay of seven weeks beyond the contract date of completion was caused chiefly by the failure of the steel contractors to deliver the steel when due.

A contract was awarded to the Reno Inclined Elevator Co., of New York, for furnishing and erecting one double-file and three single-file inclined elevators in the State Station. Of these, the double-file and one single-file, located under State

street south, have been completed to date. The remaining two single-file elevators are to be located under State street north.

Each elevator consists of what may be called an endless belt moving at an angle of 25 degrees from the horizontal between two hand-rails and carrying raised wooden treads on which the passengers stand. These treads form an angle of elevation of about 10 degrees only, thus permitting greater comfort for the passenger than the earlier Reno type, in which the standing place was parallel with the 25 degree inclination of the traveling belt. The elevators raise or lower passengers a vertical distance of about $20\frac{1}{2}$ feet between the station platform and a landing about 10 feet below the street. The single-file elevators have each a capacity of 3500 persons per hour, that of the double-file being 7000; the latter is adapted only to carrying passengers up, while the single elevators can carry either up or down. Each elevator is operated by an independent electric motor.

Westerly Addition to Subway, Haymarket Square.

General Description of Structure.—The structure consists of a widening of the Haymarket square station of the Subway to provide room for two additional tracks leading to the northerly incline. It includes a concrete invert and westerly side wall, with a roof formed of jack arches supported by steel I-beams. The total length affected by the change is 275 feet, extending north and south across the whole square, with a width from east to west varying from 8 feet at the southerly end to 30 feet at the northerly end.

Details of Construction.—The Subway roof beams were spliced and extended out to the new westerly wall. A 36" x 40" wooden box sewer on Canal street had to be changed for a length of 55 feet to admit of the widening of the Subway and was replaced by a 42" circular concrete sewer.

At the northerly end of the section a layer of about 3 feet of peat, near the bottom of the excavation, was taken out. About 80 feet of the masonry westerly wall of the old Middlesex canal and its timber foundation were removed.

Enlargement of Subway under Relief Station.

Early in May, 1908, a contract was awarded to John E. Palmer for building 128 feet of the westerly wall and 121 feet of wall between tracks under the Relief Station. These walls, of reinforced concrete, respectively 2 feet and 1 foot in thickness, are being carried as high as is practicable, without interference with the basement floor of the Relief Station, until that floor is vacated by removal to the new wing on the Canal street side of the building. The westerly wall rests upon a continuous wide footing of concrete carried down to hard blue clay, about 30 feet below street level and 12 feet below mean low water; the middle wall is carried by nine concrete piers, flared out to an enlarged cross-section at the bottom and extending to the same depth.

Details of Construction.—Two drifts, each about 7 feet wide, were first excavated on the lines of the walls, mostly between the foundations of the Relief Station, extending from the basement floor to the underside of the tunnel invert. The continuous footing of the westerly wall, below the invert, was built in sections about 16 feet long, and the piers under the central wall were built one at a time. The walls were subsequently carried up to about $5\frac{1}{2}$ feet below the basement floor. It was necessary to support a portion of the front and rear walls of the Relief Station, and this work was done for the Contractor by Isaac Blair & Co.

At the date of this report the work is substantially completed and ready for the building of the remainder of the walls and tunnel roof. This will be done as soon as the new part of the Relief Station is finished so that the basement of the old part can be vacated.

Northerly Incline.

The open incline, 227 feet in length, by which cars on the two new westerly tracks will descend to and ascend from the Subway, is located just north of the Boston City Hospital Relief Station, near Canal street. The whole structure—which is of reinforced concrete capped with granite coping—rests on spruce piles from 30 to 35 feet long. The westerly wall, built to about the level of the sidewalk, is so designed that it

may support a heavy building. The invert joins on to the old invert of the Subway incline. About two-thirds of the excavation was taken out by teams and the remainder by derrick. All of the excavated stone and concrete was crushed and used in the new concrete.

The work was completed 22 days later than the dates specified in the contract. The delay was mostly due to the old Middlesex Canal wall, on the easterly side of the incline, preventing the driving of piles as planned. It was found impracticable to readily remove the stones of the wall. Two additional rows of piles were driven to the west of them and reinforced concrete beams were laid to span from these piles to the invert of the old Subway.

INTERIOR FINISH OF STATIONS.

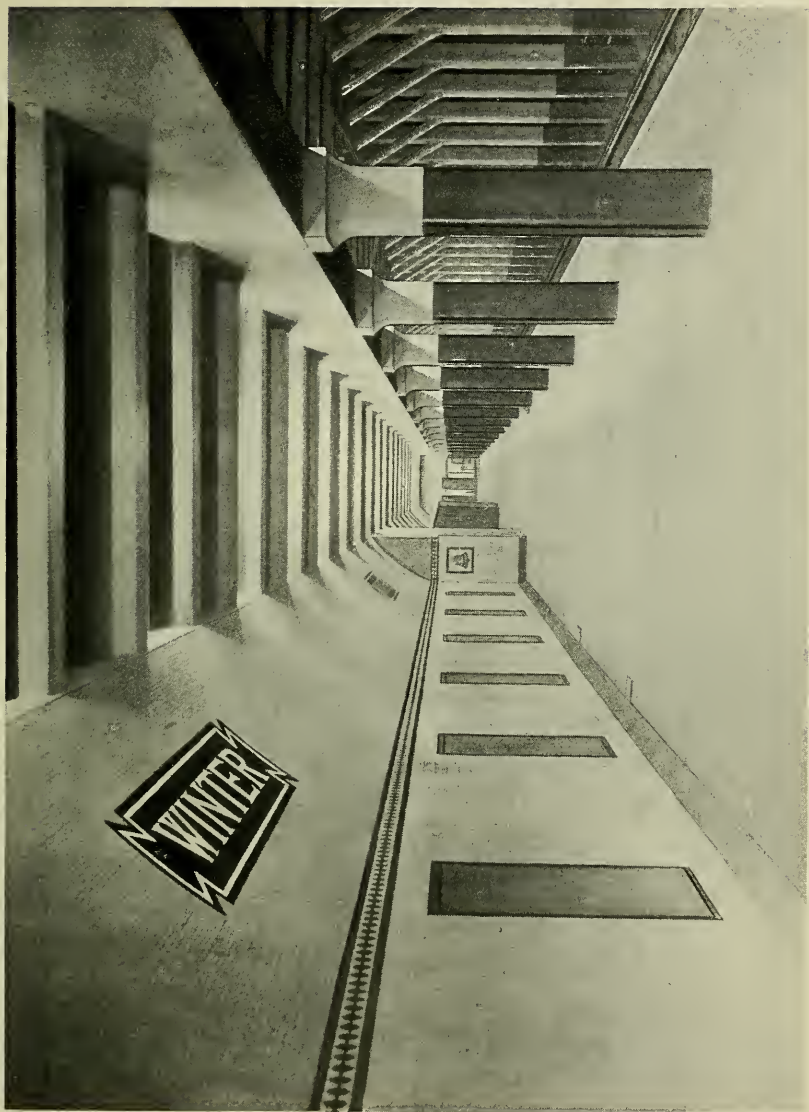
The plans adopted have included the construction of parcel rooms, telephone booths, news-stands and other accommodations for the public. The partitions are built of fireproof materials, generally of terra-cotta block, with door and window frames of reinforced concrete, and are tiled in harmony with the rest of the station.

In general, the station walls have been tiled to about the height of the eye with white enameled tile, starting from a green ceramic mosaic curved base. Above the white enameled tiling, a diamond-patterned ceramic mosaic border runs through the lobbies and up the stairs to the street level. The walls above the borders, and with some exceptions the ceilings over the platform, are tiled with white ceramic mosaic.

The names of the stations have been set in colored ceramic mosaic so as to come opposite the middle of each car, the colors being the same as the borders in each case. A distinctive color is used for each of two nearly opposite platforms, so as to aid in identifying the stations at a glance. Directory slabs of marble, giving the station name and surrounded by a border of colored ceramic mosaic tile, have been set over the various tunnel entrances.

The design of the booths, news stands, borders, letters and signs is due to the architect of the Boston Elevated Railway Co.

The stations are lighted by incandescent electric lights.



WINTER STATION OF THE WASHINGTON STREET TUNNEL, LOOKING NORTHERLY
FROM THE TEMPLE PLACE LOBBY.

Under the provisions of the Act and the lease the Elevated Railway Company has permission to place or admit unobjectionable advertisements in spaces specially adapted therefor. These places have been defined by brass-framed panels, 30 inches by 46 inches, usually at intervals of about 12 feet but in some cases arranged in groups of three or five. Thus far 438 panels have been installed, varying from 81 in Essex Station to 31 in State Station.

Plate 13 will serve as an illustration of the general appearance of the station platforms.

PIPE CHANGES.

The work of relocating pipes for Washington-street Tunnel construction is now practically completed. The relocation of the 24-inch and 12-inch water pipes in Washington street and the 16-inch water pipes in Devonshire street, between State street and Adams square, were the principal items of pipe work, done directly by the Commission, during the year.

THE CAMBRIDGE CONNECTION.

As stated in the last annual report, the Commission, after a public hearing, decided to locate the terminal in Boston for the Cambridge connection at the Park-street Station of the Subway. The line of the tunnel as determined upon extends as shown on Plate 1, under Boston Common and Beacon Hill to a point near the intersection of Phillips and Grove streets, whence the surface of the ground is reached by an incline.

The district in the vicinity of the route has been surveyed and mapped out. Borings to determine the ground have been made and others are progressing. Additional studies for a station at Park street are being made, and the question of the interchange of passengers between the present Subway, the subway to Cambridge and the proposed terminal of the Riverbank subway is receiving consideration.

THE RIVERBANK SUBWAY.

The proposed line for the Riverbank subway runs from the Park street Station of the present Subway under the Common and under Beacon, Joy, Walnut and Chestnut

streets—as indicated on Plate 1—to the embankment in process of construction along the Charles River, thence under this embankment, reaching the surface in the vicinity of Charlesgate East.

Various plans and positions for this subway have been considered, involving particularly the disposition of the sewer outlets which now discharge into the Charles River.

Borings have been made along the Riverbank and in Chestnut street near Charles and Brimmer streets.

ASSISTANTS IN THE ENGINEERING DEPARTMENT.

Appendix E gives the names of those employed in the Engineering Department for more than a month during the past year. I wish to thank them for their faithful and intelligent service and for the valuable suggestions which they have made.

Respectfully submitted,

H. A. CARSON,

Chief Engineer.

APPENDIX A.

LEASE TO WM. FILENE'S SONS CO.

THIS INDENTURE, made this twenty-second day of August, A.D. 1907, between the City of Boston, acting through the Boston Transit Commission, hereinafter called the lessor (which expression shall include the successors and assigns of said City and Commission unless the context is clearly inconsistent therewith), and Wm. Filene's Sons Company, a corporation duly organized under the laws of Massachusetts, hereinafter called the lessee (which expression shall include its successors and assigns unless the context is clearly inconsistent therewith), WITNESSETH:

In consideration of the covenants herein contained by the lessee to be performed the lessor hereby demises and leases unto the lessee all the parcel of land with the building thereon situated in the City of Boston, bounded northerly by Winter Street; easterly by Washington Street; southerly by land now estate of James J. Storrow et al., and westerly by Jackson Place, together with all rights and appurtenances thereto in, over or under said Jackson Place, excepting and reserving, however, so much of said premises as is or will be occupied by the Washington Street tunnel and the entrances thereto and exits therefrom, substantially as shown in the final plans thereof now on file in the office of said Commission, and the right to construct, maintain and use said tunnel, entrances and exits according to said plans.

TO HAVE AND TO HOLD the demised premises unto the said lessee from the first day of September, A.D. 1907, to and through the 28th day of February, A.D. 1911, unless sooner terminated as hereinafter provided, and upon notice in writing from the lessee to the lessor, given not less than six months before the expiration of said term, of election to take said premises for a further term, to have and to hold the same for the further term of ten years expiring on February 28th, A.D. 1921, unless sooner terminated as hereinafter provided.

Yielding and paying (except only in case of fire or other casualty as hereinafter mentioned) rent at the rate of Twenty-eight Thousand Dollars (\$28,000) per year in equal monthly instalments of Two Thousand Three Hundred and Thirty-three and 33-100 Dollars (\$2333.33), payable on the first day of each month for the month ending the preceding day; and at the same rate for any part of a month unexpired at the legal termination of the lease, and at the same rate for any further time beyond the expiration of the lease that the lessee or persons claiming under it may hold the said premises or any part thereof; but the rent shall be abated until December 1st next, and the first payment shall be made on January 1st, 1908, for the month ending December 31st, 1907.

Should gold dollars of the United States of present standard of weight and fineness at any time during the term be at a premium as regards then current funds, the rent so long as a premium exists as aforesaid shall be paid in gold coin of the United States of present standard of weight and fineness.

It is agreed that in case said lessee elects to take for the further term of ten years the lessor may at any time after January 31st, 1913, give notice in writing of its election to have said building appraised, and thereupon the lessee shall appoint an appraiser, the lessor shall appoint an appraiser, and these two a third; said three appraisers shall proceed to determine the

fair cash value of said leased premises and report in writing to the parties the amount fixed by them or a majority of them. If five per cent upon such value exceeds the annual rental above fixed, such rental shall for the balance of the term from the date of the appraisers' report beginning not earlier than February 28th, 1913, be increased to such amount as equals five per cent of such value, otherwise the rent payable for the balance of the term shall remain unchanged. The lessor shall pay the cost of such appraisal.

The lessee further covenants with the lessor to pay during said term as the same become due and payable all taxes, charges for water and assessments, except assessments for betterments, and will keep the premises insured at its expense for the benefit of the lessor in companies satisfactory to the lessor to an amount not less than eighty per cent of the value of the building, and will pay as part of the rental and at the time provided for payment thereof, interest at the rate of five (5) per cent per annum on all sums paid by the lessor for assessments upon the premises levied during the term, if any, for betterments (including sewer and sidewalk assessments), other than for benefits caused by the construction of said tunnel and its entrances and exits, from the time each such payment is made. It is mutually understood that the taxes, water charges, interest on betterment assessments, and insurance on the premises, are to be adjusted so that the lessee shall, subject to abatements hereinafter provided for, pay a proportionate part thereof from the beginning of and according to the actual duration of this lease, and as to the taxes such payment shall be for a proportionate part for the current year from the beginning of the term to April 30th, 1908, and for the last year of the term, or in case of termination before the end of the period specified, a proportionate part from the preceding first of May to the end of the term, according to the period elapsed; in case of any abatement of obligation to make said payments, or of termination of the lease before the end of a period for which any such payment has been made, the lessee shall be entitled to a proportionate refund of any payment already made.

The lessee covenants with the lessor as follows: To pay the said rent upon the days hereinbefore appointed (except only in case of fire and other unavoidable casualty as hereinafter mentioned), and all bills for gas, water, electric light or power supplied upon the premises during the continuance of this lease; not to make or suffer any strip or waste of said premises or overload the same, or make any unlawful, improper or offensive use thereof, or use more injurious to persons or property than the present use thereof; not to assign this lease without the consent in writing of the lessor first obtained; not to make any alteration in or upon the premises except as hereinafter provided, without the consent in writing of the lessor first obtained; to save the lessor harmless from all loss and damage occasioned by the use or escape of water or gas upon said premises, or by the bursting of the pipes, or by any nuisance made or suffered on the premises, and to assume and perform all the duties to third persons and to the public which would be incumbent upon it if it were the owner of said premises, and to indemnify and save harmless the lessor against all claims and demands arising out of any injury or accident to person or property in or about the premises; to keep the premises, inside and outside, including the glass, in as good order and repair as the same are in at the beginning of the term, or may be put in by the lessor during the term, reasonable use and wear and damage by fire or other casualty excepted; and to deliver up the premises and all future erections and additions thereon in good and tenantable repair at the end of the term, except as aforesaid.

The lessor covenants with the lessee to put said premises in condition safe and proper for occupation so far as made necessary by the work of constructing said tunnel and its entrances and exits, and to allow an abatement of the payment for taxes for the period to November 1st, 1907, and in case the work is not so far completed by December 1st, 1907, as no longer to interfere with the full use of said premises by the lessee, to make a further reasonable abatement of rent and taxes; to make provision for

direct access for passengers from said tunnel to the demised premises during the term of this lease, including such extended term, in a manner to be approved by the Commission; not to sell the demised premises at any time during said term except to the former owners, from whom the premises were lately taken by right of eminent domain, unless it has in writing offered the premises to the lessee at the same price and on the same terms within thirty days prior to such sale, and said lessee has not within five days after receipt of the offer delivered at such place in said Boston as such offer shall designate an acceptance of the same in writing and undertaking to complete the purchase within sixty days from such acceptance; but if a sale is made in compliance with this agreement, or if a sale is made to said former owners, this agreement shall not thereafter be applicable; that the lessee may at any time during said lease make such alterations in the inside arrangement and division of said building as will not impair the safety of the exterior main walls of the building, including making openings through such walls, and making openings through and removing, as far as is practicable and consistent with safety, the partition wall between the demised building and adjoining premises, and making openings in the floors; but the lessee shall notify the lessor beforehand of intention to make such alterations and submit plans thereof, and shall make no alterations not approved by the Building Department of the City of Boston and satisfactory to the Boston Board of Fire Underwriters; and the lessee shall at the end of the term, if required by the lessor, restore the premises to their original condition, so far as such alterations are concerned.

In case during the term the premises or any part thereof are taken for a public use, and the rental value of the premises is reduced in consequence thereof, then the rent herein reserved shall be proportionately reduced.

In case at any time prior to the last two years of the extended term of this lease the premises are injured or destroyed by fire or other unavoidable casualty the lessor agrees that it will either

First, restore or rebuild the building substantially as it was before, and in such case the lessee agrees that if the proper cost of so doing exceeds the amount of the insurance received it will pay as additional rent from the completion of the restoration interest at the rate of five (5) per cent per annum upon such excess, or

Second, will erect a new building on said premises adapted to the use for business of the lessee and to similar purposes, and in such case the lessee for the remainder of the term agrees to pay as rental an additional sum equal to five (5) per cent on the excess of the power cost of such building over and above the amount received for insurance on the building injured or destroyed.

In the event of injury or destruction by fire or other unavoidable casualty at any time the rent, taxes and other payments to be made by the lessee, or a proportionate part thereof according to the extent to which the use of the premises is interfered with, shall abate until the injury is repaired or rebuilding completed, and the proper cost of repairing or rebuilding shall include rental at the former rate less any rent paid for any part of the period of such interference with use, and shall also include interest at five (5) per cent on money spent from time to time for repairs or rebuilding, and a proportionate part of the taxes, and other payments to be made by the lessee, and the cost of insurance during the term of such repairing or rebuilding.

If during the last two years of the extended term the building is substantially destroyed by fire, then this lease may be terminated at the option of either the lessor or the lessee.

PROVIDED, HOWEVER, and these premises are upon the condition, that if the lessee neglects or fails to perform and observe any of the covenants, agreements, terms, or conditions contained in this instrument, whether hereinbefore or hereinafter printed or written, which on its part are to be performed or kept, or if its leasehold interest shall be taken on

execution, or if the lessee shall be declared bankrupt or insolvent, according to law, or if any assignment of its property shall be made for the benefit of its creditors, or a receiver appointed of its property, and is not discharged within thirty days, then, and in any of the said cases, the said lessor lawfully may, immediately, or at any time thereafter, while such default continues, and notwithstanding any license of any former breach of any of the said covenants, terms or conditions herein, or any waiver of the benefit thereof in a former instance without further notice or demand, enter into and upon said premises, or any part thereof, in the name of the whole, and repossess the same as of their former estate; and upon entry as aforesaid, this lease shall be determened, and said lessee and all claiming under it shall be considered to all intents and purposes as holding possession of said premises without right, so as to entitle the said lessor to any existing or future remedies under the laws of this Commonwealth for recovering summary possession thereof; or, it may expel the said lessee and all claiming under it, and remove their effects forcibly, if necessary, without being taken or deemed guilty of any manner of trespass, and, in either case, without prejudice to any remedies which might otherwise be used for arrears of rent or preceding breach of covenant; and said lessee covenants and agrees, as aforesaid, that notwithstanding such determination of said lease and possession regained, said lessor may relet the said premises, at its discretion, at the risk of said lessee, and that it will, for the remainder of said term, be and remain liable for, and will pay to said lessor any loss sustained by it on account of the said premises being let for such remainder for a sum less than herein stipulated.

It is agreed that for any period for which by reason of the ownership of the premises by the City of Boston taxes are not payable, the lessee shall pay to the lessor, instead of the rental above specified, in monthly instalments a rental at the rate of thirty-six thousand (36,000) dollars per year, less the proportion of insurance premiums for that period, subject to the same provisions as to abatement hereinbefore contained.

And the said lessor covenants and agrees with the said lessee that it paying the rent aforesaid, and performing the covenants and fulfilling the conditions and agreements herein contained, on its part to be paid, performed and fulfilled, shall peaceably hold and enjoy the said leased premises without hindrance or interruption by the said lessor, or any other persons claiming under it.

IN WITNESS WHEREOF, the Boston Transit Commission has executed this instrument, pursuant to a vote of the Commission, the members adopting a common seal and not being bound in their personal capacity; and said Wm. Filenes Sons Company has caused these presents to be signed in its name and behalf and its corporate seal to be hereto affixed, by A. Lincoln Filene, its President thereto duly authorized. Executed in duplicate.

THE CITY OF BOSTON

By

(Signed)	GEORGE G. CROCKER	} <i>The Boston Transit Commission</i> (Seal)
"	THOMAS J. GARGAN	
"	GEORGE F. SWAIN	
"	HORACE G. ALLEN	
"	JOSIAH QUINCY	

(Signed) WM. FILENE'S SONS CO

By A. LINCOLN FILENE Pres. (Corp. Seal)

APPENDIX B.

RIGHTS IN SIDEWALK AREAS.

COMMONWEALTH OF MASSACHUSETTS	Superior Court
SUFFOLK, SS.	In Equity.
SARAH H. SWAN et al,	
v.	
EDISON ELECTRIC ILLUMINATING COMPANY.	

The Act, Chapter 534 of 1902, authorizing the location and construction of the system of tunnels and sub-ways in Washington Street and other streets of the city, by the Boston Transit Commission, expressly authorized that Commission to remove and relocate any conduits, pipes, wires, poles or other property of any person or corporation which it deemed necessary to the construction and operation of the sub-way, and expressly gave power to the Commission to grant new locations for any such structures so removed or relocated. It placed the whole power of the determination of such relocations in that commission. It did not give the courts any appellate or advisory power over the action of the commission in this respect. It is possible of course that the court by virtue of its general equity power might restrain a flagrant abuse of its power not exercised in good faith, and resulting in wilful unnecessary oppression by a Commission. It is not necessary to consider that here, because the Transit Commission is not a party in or to this bill; and then upon the evidence there is no proof of such abuse of its powers. The location of the man-hole to the defendant's conduits and pipes in Winter Street, of which the plaintiffs complain, has been determined by said Commission. It does not seem to me to be important whether the exact place was first suggested by officers of the defendant or by officers of the commission. The new location has been fixed by the commission. So long as that remains fixed by the commission, the defendant must take its location where it is so fixed, if it has any. This is perhaps a sufficient reason for denying the injunction prayed for; but if the commission was made a defendant, the court would hesitate to enjoin it from making a designation of a location for other reasons.

The plaintiffs claim that they have such right of occupation in and to the area under the sidewalk in Winter Street, as that they successfully maintain that right against the order and power of the Boston Transit Commission acting under said Act of the Legislature. The plaintiffs do not have or claim to have any right to a continuance of the use of said area, except that acquired under its occupation for a long period of over 40 years. And it is probable that the area under the Winter Street sidewalk has been there since the erection of the building in 1853, and it is probable that said area was excavated about that time and that the owners of the building have enjoyed it ever since, but it began by a license or permit of the Board of Aldermen, and its use has been a permissive one—at least so far as the Legislature is concerned,—ever since. I very much doubt if a use of an area under a public street like Winter Street, so authorized, however long continued, can grow into a right which is paramount to the power or right of the Legislature, that is, I do not think that it can ripen into such a title as that the Legislature cannot interfere with it except upon "taking" it, and paying compensation. When Winter Street was

laid out, whether the land was taken by right of eminent domain or by purchase, it became thereafter devoted to such street uses as the Legislature, under whose authority it was done, might decide so long as it existed as such public street. The provisions of Section 1. Ch. 53 R.L. are not I think applicable to this case. Private persons abutting on streets are allowed to use portions in or under them in a way or manner that does not interfere with the general uses of public. But such use does not divest the Legislature—and probably not the city—of its supreme authority over the street and against all such uses; it can terminate such uses at any time,—at least when the public needs require it, of which needs the Legislature is the sole judge. In this case the Legislature has given a power to the Boston Transit Commission to remove its conduits, wires and man-holes in Winter Street, “which it deems to interfere with the construction or operation of the subway, and shall grant new locations for any said structures so removed or relocated.” The Act in the same section further on says that “such orders to the extent specified therein shall be deemed a revocation of the right or license to maintain such conduits, wires, poles or other property” which is found in the street. If the Legislature by an act could authorize the Edison Electric Illuminating Company to locate its conduits and man-hole at the place complained of,—and I have no doubt that it could do so,—I do not see why it may not do so by an authority given to the Transit Commission, if in its opinion it is reasonably necessary and proper to do so in order to accomplish the purpose of said Act of the Legislature.

From these considerations I have come to the conclusion that the injunction prayed for cannot be issued.

J. B. RICHARDSON

J. S. C.

APPENDIX C.

CONSTRUCTION IN COMMONWEALTH AVENUE.

CITY OF BOSTON
LAW DEPARTMENT
73 TREMONT STREET
BOSTON

BOSTON, November 19, 1907.

BOSTON TRANSIT COMMISSION,
15 Beacon Street,
Boston, Mass.

Gentlemen:—

I am requested by you for my opinion as to the right of the Commission under chapter 573 of the Acts of 1907 to make an entrance for the River-bank subway in Commonwealth avenue between Charlesgate east and Deerfield street.

Commonwealth avenue was originally provided for by an agreement between the Commonwealth and the Boston Water Power Company under date of December 27, 1856. By that agreement it was provided, among other things, that the Commonwealth lay out "and it doth hereby lay out so much of said avenue herein described, of the width of two hundred feet, as passes through the land belonging to said Commonwealth; that neither said Commonwealth nor its assigns shall ever erect or cause to be erected, any building on the lots bordering on said avenue within twenty feet from the lines thereof on either side; and that said avenue shall be kept open and used for the purposes and in the manner hereinbefore mentioned and described, forever."

This width of two hundred feet was to be divided as follows: "Not less than forty-four feet in width on each side to be for open streets or highways, part to be roadway and part sidewalk, and to remain forever open and unobstructed, and that the remainder of said avenue, not exceeding one hundred and twelve feet in width, shall be appropriated for a walk, the planting of trees, shrubbery, and grass, and otherwise ornamented, so as to exclude carriages, horses, and other vehicles and animals from the same, excepting where intersected by streets or avenues."

By a supplementary agreement between the Water Power Company and the Commonwealth, dated December 19, 1877, it was "mutually agreed that the direction of Commonwealth avenue westerly from West Chester Park in the City of Boston shall be deflected and changed from a straight line as shown on a plan hereto annexed, dated June 1, 1877, and that otherwise all the rights and obligations of the contracting parties hereto as to said avenue shall be, and remain the same, as though the direction of said avenue was not changed as herein provided." This plan shows the avenue in substantially the same place as it is to-day.

In October, 1880, the Boston Water Power Company conveyed the land abutting on this portion of Commonwealth avenue to Henry M. Whitney, Granville T. W. Braman and Henry D. Hyde, trustees. By this agreement this land was made subject to all indentures and agreements now in force and recorded in Registry of Deeds for Suffolk County made by said Boston Water Power Company with the Commonwealth of Massachusetts, the City of Boston, the city of Roxbury or the Boston & Roxbury Mill Corporation, either separately or any of them together, relating to the

filling of any of said granted lands or relating to streets, ways, passageways, drains, sewers or buildings thereon. The present owners got title from the said Whitney, Braman and Hyde.

I am of the opinion that the provisions of this conveyance give the abutting owners opposite this open space whatever rights the Boston Water Power Company had under this agreement with the Commonwealth; that their land was made subject to the limitations and restrictions set forth in that agreement and was also entitled to the benefits of said agreement. It seems to me clear that in any event these abutting owners can recover damages if an open cut and the walls thereof are placed in the roadway or the one hundred and twelve feet reservation.

The doubtful question is as to whether the abutters cannot have the Transit Commission enjoined from placing this open cut in Commonwealth avenue under the claim that the Commonwealth and its agents ought not to be allowed to break an agreement made by the Commonwealth. It seems to me that this agreement was not of such a nature that its terms could not be changed by the Commonwealth so far as the use of the highway was concerned for public travel if proper damages were provided for any party who was injured by a change in the use contemplated by the agreement.

Commonwealth avenue is a public way under the control of the Commonwealth; the use to which it is to be devoted is a public use for public travel and such use is expressly authorized by the act of 1907. The question then is, are such damages provided for by the act.

If the damages to the abutting estates can be recovered for under the act, then I do not think the courts would enjoin the Transit Commission from constructing this incline and open cut in Commonwealth avenue. That such damages can be recovered by petition against the City is decided in the case of *Ladd v. Boston*, 151 Mass. 585, and the damage clause in the subway act is more liberal than the damage clause in the courthouse taking which was the subject of controversy in the *Ladd* case.

The doubt in my mind arises under the sixth section of the act which provides that the Commission may for the purposes of this act, use public ways and lands without compensation therefor. So strong an argument could be made under this clause that it was not the intention of the Legislature to give damages to the abutting owners for any subway taking in a public street like Commonwealth avenue, that I do not think it would be advisable to proceed to make the open cut and incline in Commonwealth avenue at this point until the act was so amended as to clearly provide that persons whose property was injured by reason of the breach of the conditions and restrictions in these agreements could recover damages.

Yours truly,

(Signed)

THOMAS M. BABSON,
Corporation Counsel.

APPENDIX D.

REPORT TO THE LEGISLATURE ON THE INVESTIGATION OF
CONGESTION OF TRAFFIC.BOSTON TRANSIT COMMISSION,
15 BEACON STREET, BOSTON, Jan. 10, 1908.*To the Honorable Senate and House of Representatives.*

The following is a copy of chapter 247 of the Acts of the Legislature for the year 1907:—

“AN ACT TO PROVIDE FOR AN INVESTIGATION OF CONGESTION OF TRAFFIC IN THE STREETS OF THE CITY OF BOSTON.

“SECTION 1. The Boston transit commission, when an appropriation sufficient to meet the expenses of such an investigation has been made by the city government, shall investigate the congestion and delay of teaming traffic and of the movement of freight within the city of Boston, and shall consider whether such congestion and delay can be relieved by the construction of subways for the transfer of freight, and shall report its conclusions and recommendations to the general court not later than January tenth, nineteen hundred and eight.

“SECTION 2. This act shall take effect upon its passage.”

The following order, having been passed by the City Council of Boston, was approved by the Mayor on June 15, 1907:—

“Ordered, That the City Auditor be authorized to transfer from the Reserve Fund to an appropriation for the investigation of congestion of traffic in the streets of Boston the sum of five thousand dollars (\$5,000), to be expended by the Boston Transit Commission under the provisions of chapter 247 of the Acts of 1907.”

The Boston Transit Commission has made the investigation called for by the act, and submits its report under the following heads:—

- I. The existing conditions.
- II. Possible remedies and experience in other cities.
- III. Summary and recommendations.

I. EXISTING CONDITIONS.

- A. The congested district.
- B. The nature and amount of the teaming traffic.
- C. The streets.
- D. Street obstructions.
- E. Existing regulations.

A. THE CONGESTED DISTRICT.

The principal congestion occurs within the district bounded on the south by Kneeland Street, on the east and north by the harbor and Charles River, and on the west by the Common and Beacon Hill. This district is about a mile in length and half a mile in width. On its north side are the

freight and passenger terminals of the Boston & Maine Railroad system, and on its south side those of the New York, New Haven & Hartford Railroad and the Boston & Albany division of the New York Central & Hudson River Railroad. It is the business center of the city,—it contains popular shops, large wholesale stores, most of the shipping interests and financial institutions, markets, theatres, office buildings and not a few manufacturing plants.

B. THE NATURE AND AMOUNT OF THE TEAMING TRAFFIC.

The teaming traffic of the congested district is of that amount and multifarious character ordinarily requisite for a live and compact shopping, wholesale, market, office and financial center.

The following tables give statistics obtained by actual count by our observers as to the amount of freight and the number of teams passing to and fro between the congested district and the respective freight yards on the north and on the south:—

TEAMING AT FREIGHT YARDS, JULY 9 AND 10, 1907.

Boston & Maine.

Inward teams, 6,302.		Outward teams, 6,061.	
	Per Cent.		Per Cent.
Empty, ...	30	Empty, ...	42
Part load, ...	22	Part load, ...	21
Half "	20	Half "	15
Full "	28	Full "	22

New York, New Haven & Hartford.

Inward teams, 2,964.		Outward teams, 2,898.	
	Per Cent.		Per Cent.
Empty, ...	33	Empty, ...	41
Part load, ...	22	Part load, ...	20
Half "	19	Half "	13
Full "	26	Full "	26

Boston & Albany.

Inward teams, 1,853.		Outward teams, 1,821.	
	Per Cent.		Per Cent.
Empty, ...	28	Empty, ...	41
Part load, ...	23	Part load, ...	21
Half "	18	Half "	13
Full "	31	Full "	25

Total for Boston & Maine, New York, New Haven & Hartford, and Boston & Albany.

Inward teams, 11,119.		Outward teams, 10,780.	
	Per Cent.		Per Cent.
Empty, ...	31	Empty, ...	42
Part load, ...	22	Part load, ...	21
Half "	19	Half "	13
Full "	28	Full "	24

It appears from the foregoing table that at the freight station of the Boston & Maine Railroad 70 per cent. of the teams coming to the station have but half a load or less, and of these nearly one-half are empty. The proportions are about the same at the other freight yards. Of the teams leaving the freight yards, over 70 per cent. again have only half a load or less, and more than one-half of these are empty. Only about 25 per cent. of the teams coming and going are fully loaded.

There appears to be no great amount of freight teamed between the freight stations for further transshipment. Such transfer and transshipment are comparatively expensive. The average cartage charges in New York, for instance, and in Buffalo, are said to equal the freight charges between New York and Buffalo.

Freight which is to be transferred from the Boston & Maine station to the Boston & Albany station generally goes by the Grand Junction Railroad; while for freight which is to be transferred between the Boston & Maine and the New York, New Haven & Hartford there are connections at Lowell, Concord Junction, Clinton, Worcester and Springfield, by which it may be diverted without going through Boston. It is estimated that about 5,000 tons per month are carried by teams from the Boston & Maine freight houses to the freight houses of the Boston & Albany and the New York, New Haven & Hartford railroads for transportation and distribution on those lines. Only freight which is to go from points a short distance from Boston on the north to points a short distance away on the south, as, for instance, between Lynn and Brockton, may properly be transferred through the city.

A considerable amount of freight is carried to and fro between the freight stations and the wharves. The principal congestion, however, is caused by the transfer of freight between stations and the wholesale and retail district, and its subsequent distribution.

It is impossible to arrive at any accurate figures concerning the amount of freight traffic from the railroad terminals through the streets, but from the best information available it is estimated that the average number of tons of freight taken from the freight terminals of the Boston & Maine Railroad in Boston and teamed through the streets is about 200,000 tons per month; and the average number of tons of freight going outward from the same freight houses and teamed through the streets is about 125,000 tons per month. About 12,000 tons per month go from the freight stations of the Boston & Maine Railroad to various steamship lines sailing from Atlantic Avenue wharves.

In addition to this, a very large freight tonnage goes from the Boston & Maine terminals to the steamers by way of the Union Freight Railway, none of this, of course, being teamed.

Very little freight is teamed from the Boston & Maine terminals to the Boston trans-Atlantic docks, practically all of this freight being delivered in the cars at the wharves.

With reference to the street freight traffic to and from the freight yards of the New York, New Haven & Hartford Railroad, it is roughly estimated that 65,000 tons are forwarded yearly through the streets from these yards to those of the Boston & Maine Railroad.

Diagrams are submitted herewith, illustrating in a general way the amount of traffic at various points in the congested district, and the routes taken by it. It is to be noted that the north-bound traffic from Congress Street goes mostly through Exchange Street, while the north-bound traffic on Devonshire Street after crossing State Street continues on Devonshire Street. At Adams Square the south-bound traffic of Washington Street goes through Devonshire Street, scarcely any of it passing through Exchange Street. The south-bound traffic in Exchange Street comes mainly from Union Street. On the other hand, the north-bound traffic which has passed through Exchange Street divides almost equally between Washington Street and Union Street. Almost all of that from Devonshire Street continues on Washington Street. Apparently Exchange Street carries per foot of width double the teaming traffic of any other street in the city. On this street, which is only 16 feet wide between curbs, or only enough for two lines of teams, there is little occasion for teams to stop, and the movement in each direction is practically continuous.

On Congress Street and on Devonshire Street between State Street and Adams Square there is a street car traffic amounting to a maximum of 140 cars per hour, which, together with the large teaming traffic, causes much confusion and congestion. This congestion is increased by the fact

that the traffic through Devonshire Street has to pass around the east end of the Old State House, and is much blocked by standing express teams.

Of the traffic which crosses Hanover Street in either direction, it is shown that Washington, Union and Blackstone streets carry about equal amounts, and Portland Street about one-half as much as each of said streets.

If the trucking to and from the railroad freight stations could be handled by one central authority,—if, for instance, the railroad company could take its freight from the station to the consignee and from the consignor to the station,—the traffic could be so regulated that more teams could be hauled full and much space would be saved in the streets. Under the present arrangement, however, the merchant has to send his truckmen to the station to receive and deliver goods, and, unless by a fortunate combination of orders, the team will go empty to the station, bring the goods to the warehouse, and go from the warehouse empty, and the conditions are similar when goods are to be forwarded.

In England the railroad companies deliver and receive freight at the warehouses, and it would seem that by some such arrangement a great economy might be effected.

One of the most striking facts which this investigation has disclosed, as already mentioned, is the large proportion of empty or lightly loaded teams which pass to and from the freight stations. Some improvement in this respect is being made in other places. The New Haven road handles some freight in Providence by trolley during the night time, by means of spur tracks from the street railways into the factories and freight houses.

Instead of consolidating the teaming business in the hands of the railroad companies, essentially the same results might be brought about by the consolidation of the teaming interests themselves. There seems to be at the present time a distinct tendency in this direction.

C. THE STREETS.

North and south through the heart of this business district there is but one continuous thoroughfare, namely, Washington street. It is neither wide nor straight. Between Adams Square and Milk Street it carries one street car track. The narrowest part of this section of the street is 26 feet between curbs, the two sidewalks occupying 18 feet. At the time of greatest traffic the attempt is made to pass about 100 cars per hour on this piece of single track.

In that part of Washington Street between Milk Street and Kneeland Street there are two street railway tracks, and the narrowest part of this section of the street is 30.5 feet between curbs, the two sidewalks occupying 18.5 feet.

On the section between Summer and Boylston streets in the hour of greatest traffic 137 cars are scheduled to pass over each of the tracks. Congestion frequently occurs, with long lines of cars standing still or progressing very slowly. It is to be expected that the approaching opening of the Washington Street tunnel will diminish the number of surface cars now needed for the passenger traffic of the district.

Traffic threads its way through the heart of the congested district by other routes than this single continuous thoroughfare, but they all involve sharp turns and much crookedness.

One main route for this traffic is through Washington Street on the north to Adams Square, and then either through Exchange and Congress streets or through Devonshire and Federal streets. Some traffic also follows Union or Blackstone streets through the market districts, Merchants Row, Kilby or Broad street. Either of these routes, however, is much obstructed along most of its length. The route through Union Street, the market district and Merchants Row is rendered almost impracticable for any considerable amount of through traffic, on account of the obstruction due to standing teams, curb markets, etc.

Circling around on the east side of the district along the water front is a continuous thoroughfare made up of Atlantic Avenue, Commercial

and Causeway streets. These streets, though of fair width, are obstructed so far as teaming is concerned by the supports for a double-track elevated railway, by two lines of street railway tracks, and by two lines of steam railroad tracks for a part of the distance and one for the rest, connecting the railroad terminals with each other, and having spur tracks running to various wharves and warehouses. These obstructions greatly diminish the usefulness of this route for teaming traffic. The narrowest part of this route is in Commercial Street, where the roadway between curbs is 44.9 feet wide; and Causeway Street, where the roadway between curbs is 51 feet wide.

On the west side of the district is Tremont Street, extending as far as Scollay Square on the north, from which there are three principal exits, namely, Hanover, Sudbury and Court streets. On this route between Boylston Street and Scollay Square there are no surface cars. There is some congestion near Boylston Street at the Park-Winter Street and at the Beacon-School Street crossings, and at the junction with Scollay Square.

The streets in which the greatest congestion of traffic north and south now occurs are as follows:—

Washington Street, between	Adams Square and	Eliot Street.
Devonshire	"	" " " Summer Street.
Exchange	"	Dock " " State Street.
Congress	"	State Street and Post Office Square.
Chauncy	"	Summer and Essex streets.
Kingston	"	" " " " "
Dock Square.		
Merchants Row and all streets surrounding	Faneuil Hall and the markets.	
Commercial Street.		
Union	"	
Blackstone	"	
North	"	between Blackstone Street and Dock Square.
Lowell	"	
Causeway	"	

There is also a lack of continuous avenues of adequate width for east and west traffic. Eliot and Kneeland streets at the southern extremity of the congested district form the best thoroughfare. Another route is made up of Boylston and Essex streets, crossing Washington Street diagonally.

All of the other east and west streets are cut off from being thoroughfares to the west by the Common and Beacon Hill, until the north side of the hill is reached, where Cambridge and Court streets combined with either State or Hanover streets form a through but very crooked route.

In the following streets east and west traffic is frequently congested:—

Boylston Street, at its junction with	Washington Street.
West	"
Bedford	"
Avon	"
Winter	"
Bromfield	"
Milk	" between Washington Street and Post Office Square.
School	"
Water	" " Washington and Devonshire streets.
Court	"
State	" " Washington and Broad streets.

And in all of the streets around the markets.

The following table shows how narrow are the streets in the business center as compared with streets of similar importance in other cities:—

Comparative Street Measurements in Large Cities of the United States.

CITY AND POPULATION.	Street.	Approximate Direction.	Number of Car Tracks.	Total Width of Street (Feet).	Width of Roadway (Feet).	Width of Two Sidewalks (Feet).
Baltimore, 509,000,	Baltimore . . .	E. and W.	1-2	66	39.6	26.4
	Lombard, . . .	"	1-2	66	39.6	26.4
	Pratt, . . .	"	1-2	66-120	40-80	26.4-40
	Charles, . . .	N. and S.	2	50-76	30-46	20-30
	Light, . . .	"	2	106-126	66-86	40
Buffalo, 352,000,	Ferry, . . .	E. and W.	1-2	66-100	30-40	26-60
	Genesee, . . .	"	2	66-99	42-58	24-66
	Broadway, . . .	"	2	99	42-60	39-57
	Elk, . . .	"	1-2	66	42	24
	Seneca, . . .	"	1-2	66	38-42	24-28
	William, . . .	"	2	66	42	24
	Delaware Ave., . . .	N. and S.	2	90-99	36-42	54-59
	Main, . . .	"	2-3	99	40-58	41-59
	Washington, . . .	"	2	66	36-42	24-30
	Franklin, . . .	"	2	66	32-42	24-34
	Michigan, . . .	"	2	50-66	32-42	18-24
	Niagara, . . .	"	1-2	99	42-60	39-57
Chicago, 1,700,000 .	Front, . . .	"	0	.99	42	57
	All streets, . . .	—	—	66	38	28
Cleveland, 382,000, .	Lorain, . . .	E. and W.	2	66	40	26
	Detroit Ave., . . .	"	2	66-83	42-47	22-36
	Superior, . . .	"	2-4	80-132	50-96	30-82
	Ontario, . . .	"	2	99	49-66	33-50
	Euclid Ave., . . .	"	2	80-99	42-60	30-57
	Prospect Ave., . . .	"	2	83	42-55	28-40
	Scoville Ave., . . .	"	2	60	34	26
	West 25th, . . .	N. and S.	2	66-83	42-47	21-36
	Broadway, . . .	"	2	60-99	42-59	18-40
	East 55th, . . .	"	2	80-100	40-50	40-50
	East 105th, . . .	"	2	50-60	34-40	16-22
Detroit, 286,000, .	Woodward Ave., . . .	N. and S.	2	96-120	61-80	35-40
	Michigan Ave., . . .	E. and W.	2	100	66	34
	Grand River Ave., . . .	"	2	60	40	20
	Gratiot Ave., . . .	"	2	72	36	36
Kansas City, 164,00,	Main, . . .	N. and S.	1-2	60-66	36-46	20-24
	Walnut, . . .	"	2	66-80	43-48	18-32
	Grand Ave., . . .	"	2	99	66	30
	Delaware, . . .	"	1	65-70	39-42	26-28
	Baltimore Ave., . . .	"	0	60	36	24
	12th, . . .	E. and W.	2	30-58	19-36	11-24
	11th, . . .	"	0-2	60-70	36-46	24
	Broadway, . . .	N. and S.	0-2	80	32-48	48-32
	Hickory, . . .	"	0	60	36	24
	Mulberry, . . .	N. and S.	0	60	36-38	22-24
	Santa Fé, . . .	"	0	80	48-60	20-32
	8th, . . .	E. and W.	0	70	42	28
	9th, . . .	"	0-2	70	50	20
	10th, . . .	"	0	70	42-54	16-28
	St. Louis, Ave., . . .	"	0	58-70	42-50	8-28
	Union Ave., . . .	"	2	65-70	45-50	20-24
New York, 3,450,000,	Broadway, . . .	N. and S.	2	70-80	—	—
	West Broadway, . . .	"	2	100	48-58	32
	Christopher, . . .	"	1	100	60	40
	8th Ave., . . .	"	2	100	40	60
	5th Ave., . . .	"	0	100	40	60
	2d Ave., . . .	"	2	100	40	60
	14th, . . .	E. and W.	2	100	40	60
	42d, . . .	"	2	100	40-60	60-40
	57th, . . .	"	0	100	40	60
	59th, . . .	"	2	100	45	55
	23d, . . .	"	2	100	40	60
	34th, . . .	"	2	100	40-60	60-40

Comparative Street Measurements, continued.

CITY AND POPULATION.	Street.	Approximate Direction.	Number of Car Tracks.	Total Width of Street (Feet).	Width of Roadway (Feet).	Width of Two Sidewalks (Feet.)
Philadelphia, 1,300,000,	Broad,	N. and S.	0	113	69	44
	8th, ...	"	1	50	26	24
	2d, ...	"	1	50	26	24
	Passyunk Ave., ..	"	1-2	50	26	24
	Ridge Ave., . . .	"	2	60	34	26
	Germantown Ave., .	"	1-2	60	34	26
	Market, ...	E. and W.	2 ¹	100	64	36
	Chestnut, ...	"	1	60	26	34
	Walnut, ...	"	1	50	26	24
	South, ...	"	1	50	26	24
	Arch, ...	"	2	72	44	28
	Girard Ave., . . .	"	2	120	84	36
	Columbia Ave., . .	"	2	60	34	26
	Diamond, ...	"	0	50-70	26-42	24-28
St. Louis, 575,000, .	Broadway, ...	N. and S.	2	80	50	30
	4th, ...	"	2	80	50	30
	6th, ...	"	1-2	60	36	24
	7th, ...	"	1-2	60	36	24
	8th, ...	"	1	60	36	24
	9th, ...	"	1-2	60	36	24
	Walnut, ...	E. and W.	2	50-60	30-36	20-24
	Market, ...	"	2	60	36	24
	Chestnut, ...	"	0	60	36	24
	Pine, ...	"	2	60	36	24
	Olive, ...	"	2	60	36	24
	Locust, ...	"	2	60	36	24
Boston, 600,000, . .	Washington, . . .	N. and S.	2	46-86	27-65	18-22
	Devonshire, . . .	"	0-2	50-56	36-39	13-17
	Congress, ...	"	2	54-56	36-37	18-19
	Exchange, ...	"	0	23-26	16-17	7-10
	State, ...	E. and W.	0	53-74	31-49	22-25
	Kilby, ...	N. and S.	0	39-54	25-34	14-20
	Merchants Row, .	"	0	36-54	24-38	12-20
	Broad, ...	"	0	46-70	29-50	17-20
	Commercial, . . .	"	0	64-68	45-46	20-22
	Blackstone, . . .	"	0	62-69	41-50	19-21
	Beverly, ...	"	2	50-51	36	14-15
	Haverhill, . . .	"	1	51-52	33-35	16-18
	Merrimac, ...	"	1-2	50	32	18
	Portland, ...	"	2	51	34	17
	Friend, ...	"	0	30-41	18-25	12-16
	Union, ...	"	0	51-52	36	15-16
	Clinton, ...	E. and W.	0	51-72	34-51	15-21
	North, ...	"	0	31-61	19-42	12-19
	Hanover, ...	"	2	60-64	41	19-23

¹ Also, double-track elevated line.

D. STREET OBSTRUCTIONS.

The obstruction of streets by standing teams is to a certain extent unavoidable. A street should be wide enough between curbs to allow for teams standing on either side, and for the passage of at least two lines of teams, one in each direction. Allowing 10 feet for a team, the width between curbs of a street suitable for large traffic should not be less than 40 feet. If there are street car tracks, and especially if they carry a large number of cars, the street should be wide enough for two lines of teams on either side of the cars, which would call for a street not less than 60 feet in width between curbs. These are conditions which, as shown by the table already given, are not fulfilled by our city streets.

Unnecessary obstruction is caused by the use of our streets by teams, not simply for stopping places, but for hack, express and feeding stands; also by teams unnecessarily backed up to the sidewalk to deliver goods;

by itinerant vendors with or without push-carts; by market teams which use the wagon as a place of business or as a stall; and by teams delivering ice, coal, etc., and collecting ashes and refuse of various kinds during principal business hours.

At several points in our streets are located so-called "general express offices," where the business of local and suburban expresses is transacted. Here are call boxes of each express, and sometimes a general shipping room for the transfer of parcels. At such offices the wagons of each company call several times daily to pick up any goods awaiting them, and to obtain the call orders left in their boxes. These offices may have from 25 to 100 such boxes. The shipping room is not infrequently too small to transact the business, and the deficiency is overcome by having the wagons drawn up alongside or backed up to each other, and the necessary transfer of packages from one to another made in the street. This is known as "swapping." Often to facilitate the transfer the goods are dumped in the street itself, and so the street becomes a shipping room, at the expense of the public. There are some of these express offices within the market limits, and several others in the immediate vicinity where the congestion is greatest. It is not unusual to find the express wagons lining the street in the vicinity of such offices. Such conditions notably occur in Devonshire Street, north of State Street, and Merchants Row, Union and Kingston streets. If it is impossible to cause the express offices to be removed to places where they will not cause congestion, then their business should be restricted and controlled. No street "swapping" in the congested district should be allowed, under any conditions. This regulation seems imperative.

Obstructions due to Curb Markets.

Market limits as established many years ago included North and South Market streets east of Faneuil Hall, and a strip of that part of Commercial Street lying between North and South Market streets. Under authority of chapter 376, Statutes of 1896, the market limits have been enlarged. The act reads as follows:—

"SECTION 1. The board of street commissioners of the city of Boston, with the approval of the mayor, may in the manner prescribed for laying out highways in said city, from time to time extend the market limits of said city to the extent which they may deem to be desirable, and may take land therefor in the manner provided for taking land for highways in said city, whether such land is at the time of taking used as a highway or for any other public purpose.

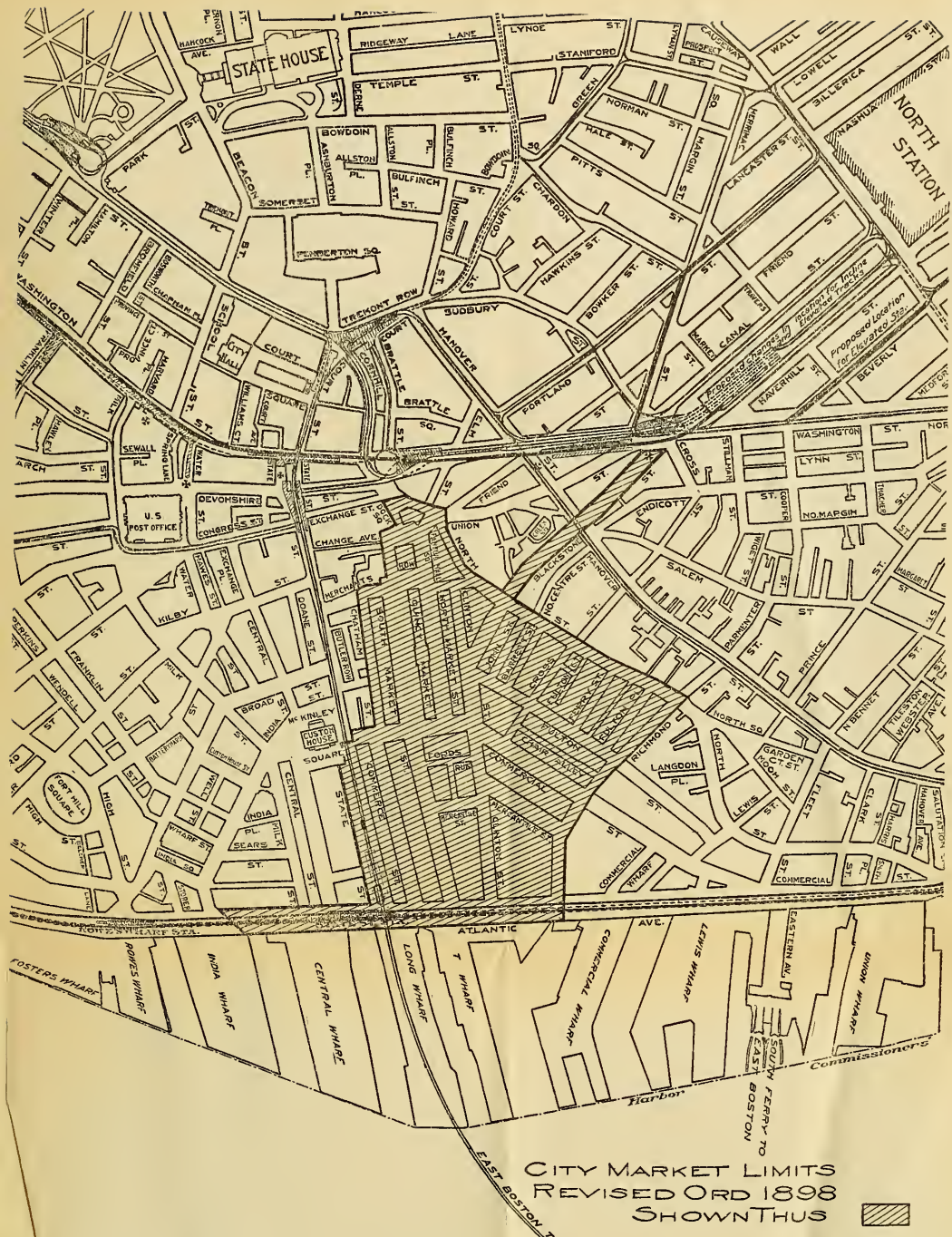
"SECTION 2. Any person whose land is taken under the provisions of the preceding section shall have his damages incurred thereby paid by said city, and may have such damages determined in the manner provided for the determination of damages for taking land for highways in said city; and judgment shall be entered and execution shall issue for the prevailing party as in civil cases."

Under the authority of this act the street commissioners added to the market limits as indicated in the Revised Ordinances for 1898. The present area within these limits is shown on the accompanying map.

The curb markets in the vicinity of Faneuil Hall, encroaching on the roadway as they do, with their barrels, crates and standing teams, cause serious congestion. They block and delay the large traffic seeking passage through Commercial Street, and between Friend and Union streets on the north and Merchants Row on the south.

The market district and its vicinity, as well as other parts of the congested district of the city, are often invaded by push-cart vendors, especially on Saturdays, who sell fruit and other articles to the passer-by. Their numbers are not large, but they often locate in the narrowest parts of busy streets, where they cause considerable obstruction.

Chapter 584 of the Acts of 1907, relating to the use of public streets in the city of Boston for the storage and sale of merchandise, has made it



CITY MARKET LIMITS
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possible for the street commissioners, in conjunction with the police commissioner, to restrict the use of public streets for these purposes. In fact, the police commissioner has already promulgated improved and more effective regulations for hawkers and peddlers, a copy of which will be found in Appendix D. Experience will show whether any amendment of these regulations is desirable.

The obstructions due to curb markets within the market limits are very serious, and practically make it impossible for any considerable amount of traffic to pass through the district. The streets and sidewalks are used for the sale of produce, to the great detriment of traffic, and are blocked with standing teams, barrels, crates and other obstructions. Such practical closing to traffic of any street within the market limits should not be permitted.

Obstruction on Atlantic Avenue.

In the operation of the Union Freight Railway, which runs on this avenue between the North and South stations, from 120 to 180 cars are handled in twenty-four hours. Most of the car movements are made at night, but on account of the limited capacity of sidings and spurs it seems impossible to avoid some shifting of cars during the daytime, especially as much of the freight handled is perishable. Perhaps little improvement can be made with reference to the method of handling these cars; but in view of the unquestionable delays now caused both to foot passengers and to teams, an earnest effort to discover improved methods should be made. There is complaint that cars are left standing at all hours on the tracks. Numerous blockades and delays are due to shifting cars on spur tracks to and from storehouses, markets and wharves. Delays of from three to fifteen minutes are reported. In order to avoid these delays, the through traffic generally keeps to the west of the freight railway. This enables teams to avoid the trains, but reduces the capacity of the street nearly one-half. Delays also occur caused by trains being allowed to stand on the avenue opposite cross streets. Stops of this kind lasting from one to four hours have been reported.

In addition to the delays due to the trains, the pavement between and around the four tracks in this street is in some places in bad condition. Teams sometimes get stuck in ruts which are from one to four inches deep.

E. EXISTING REGULATIONS.

The following are some of the most important provisions of the ordinances of the city, of the regulations of the Board of Aldermen and of the Police Manual which have a bearing upon street traffic. Chapter 584 of the Acts of 1907 will be found in Appendix A.

"Ordinances.

"CHAPTER 47.

"Use of Streets.

"SEC. 32 (as amended by ch. 5, Ord. 1903). No person having the care of a horse, or other beast of burden, carriage, or draught, shall drive, or ride, or permit such horse, beast of burden, carriage, or draught to go at a greater rate of speed than seven miles an hour in a public street, except in wards 22, 23, 24, and 25, nor in a public street in said excepted portion of the city at a greater rate than twelve miles an hour. The provision of this section or any other provision in the ordinances relative to the speed of vehicles shall not apply to the fire department of the city, or to ambulances connected with any hospital, or to emergency wagons of a street railway while responding to a call.

"SEC. 33. No person shall drive or convey through the public streets any vehicle the width of which, with its load, exceeds ten feet, except in accordance with a permit from the Superintendent of Streets.

"SEC. 34 (as amended by ch. 1, Ord. 1903). No person shall, in a street, wilfully, maliciously and wantonly, obstruct the free passage of foot travellers, nor shall any person in a street, except in that part of Otis street between Franklin street and Summer street, during the part of the day between the hours of 11 A.M. and 2 P.M., wilfully, maliciously and wantonly saunter and loiter for more than five minutes after being directed by a police officer to move on.

"SEC. 35. No person shall, except in accordance with a permit from the superintendent of streets, in any street or from any building outside of the Faneuil Hall market limits sell any goods or article to any person on the street, or, in any street, outside of said limits, place or permit to remain for more than ten minutes any goods or article of which he is the owner or in charge, or, while on foot, carry and display any showcard, placard, or sign.

"The Market Limits.

"SEC. 61. No person shall, within any market limits, so occupy or obstruct any sidewalk as not to leave a clear and direct passage for travellers thereon; nor so place or stop any vehicle abreast of, or near to, any other vehicle as not to leave a clear and direct passage for other vehicles.

"SEC. 64. No person shall, within any market limits, neglect, or refuse to obey or comply with any reasonable direction of the superintendent of markets, or either of his deputies, or of any police officer.

"Regulations of the Board of Aldermen.

"CHAPTER 5 (AS AMENDED BY CHAPTER 2, REG. 1903).

"SEC. 4. The Superintendent may place on such streets and public alleys as he shall judge expedient signs bearing the name or designation of the street or alley and bearing the form of an arrow showing the direction in which persons with vehicles going along such street or alley shall pass, and all such persons shall pass in the direction so indicated.

"CHAPTER 6.

"SEC. 1. No person having charge of any vehicle in a street shall stop his vehicle abreast of another vehicle, nor so as to obstruct a street or any sidewalk or crossing of a street, nor shall any such person snap a whip while his horse or beast is stopping in a street.

"SEC. 4. No person having charge of a truck, cart, wagon, sled, or a dray with an animal attached thereto to draw the same, shall in any street drive said animal attached thereto at other than a moderate foot pace, nor shall any such person, when riding, cease from holding the reins in his hands to guide and restrain such animal, nor, when not riding, cease from walking by the head of the shaft or wheel animal, either holding, or keeping within reach of, the bridle or halter thereof.

"SEC. 5. No person shall in any street use any truck or dray, the length whereof, from the end of the shaft to the extreme end of the side, shall be greater than twenty-four feet and six inches.

"SEC. 6 (as amended by Reg. 1902, Ch. 4). No person shall carry, or cause to be carried on any vehicle in any street, a load the weight whereof exceeds six tons, unless such load consists of an article which cannot be divided, provided, however, that no load the weight whereof exceeds three tons shall be carried on any vehicle in State street, between the Old State House and Kilby street, during the construction of the East Boston tunnel, unless delivery of said load is to be made in said portion of said State street.

"SEC. 7. No person having in any street the charge of a vehicle shall neglect or refuse to stop the same, or to place the same when stopped, as directed by a police officer.

"SEC. 8. No person having the charge of any vehicle shall allow the same, without an animal harnessed thereto, to remain in the street, except as provided in section fourteen.

"SEC. 9. No person having in any street the charge of a vehicle, with an animal attached thereto to draw the same, shall allow such animal at a crossing of a street to come within ten feet of any vehicle in front of him.

"SEC. 10. No person shall in any street at one time drive, guide, or have the care of two animals harnessed respectively to different vehicles.

"SEC. 11. No person having the charge of a vehicle, with an animal attached thereto to draw the same, shall drive, or allow such animal to go round a corner of a street at a gait faster than a walk.

"SEC. 14. No person having the charge of a vehicle, with or without an animal harnessed thereto, shall suffer the same to remain in a street for more than five minutes, without some proper person to take care of the same, unless hitched to a post or a sufficient weight, or otherwise held by some appliance approved by the superintendent of streets, nor for more than twenty minutes in any case; but no person shall be deemed to have violated this provision who shall satisfy the court that he was a physician visiting the sick, or a market or provision man standing for the purpose of selling provisions until eleven o'clock in the forenoon at places in the city lawfully designated therefor.

"SEC. 16. No person having charge of a vehicle shall so place the same in a street as to prevent the passing of other vehicles, unless it is for a reasonable time, not exceeding six minutes, for the loading or unloading of coal, wood or lumber, brick or stone, or of heavy articles, the weight of which in any one parcel or package is not less than six hundred pounds.

"SEC. 17. No person with or having the care of any cart, barrow, hand-cart, wagon, or other vehicle, shall, except in accordance with an order of the board of aldermen, stop or stand, for the purpose of hawking, peddling, or selling any goods, wares, or merchandise, fruit or other articles, between the hours of eight o'clock A.M. and half-past six o'clock P.M., in, or occupy any part of, any of the following streets, ways, and squares, namely: Haymarket square, Sudbury street, Court street from Sudbury street to Scollay square, Scollay square, Tremont street from Scollay square to Eliot street, Eliot street from Tremont street to Washington street, Washington street from Eliot street to Franklin street, Franklin street from Washington street to Devonshire street, Devonshire street from Franklin street to Milk street, Milk street from Devonshire street to Pearl street, Post-office square, Water street from Congress street to Devonshire street, Devonshire street from Water street to Washington street, State street between Merchants row and Devonshire street, and Washington street from Adams square to Haymarket square, or any of the streets, ways, or squares included within the territory bounded as above described, nor shall any person having the care of any carriage, wagon, truck, or other vehicle with an animal attached thereto, drive or pass over or upon Spring lane, or that part of Congress square about ninety feet in length, extending in a southerly direction from State street and north of the way connecting Congress street and Devonshire street, or that part of Congress square extending easterly from Devonshire street and lying between the Phoenix and Brazer buildings, so called. Nor shall any person having the care of any wheel-barrow or hand-cart, except in accordance with an order of the board of aldermen, stop or stand in, or occupy any part of, any of the streets, ways, and squares in the city proper north of Massachusetts avenue, for the purpose of hawking, peddling, or selling any goods, wares, or merchandise, fruit, or other articles, between the hours of eight o'clock A.M. and half-past six, P.M.

"SEC. 18 (as amended by Reg. 1903, Ch. 3). No person having charge of a vehicle shall, unless otherwise directed by a police officer, pass along a street or public alley in a direction contrary to that designated by the sign thereon, if any, placed on the side of such street or alley, nor stop such vehicle, in any street otherwise than lengthwise with the street, close to the sidewalk, and on the same side of the street with any other vehicle already stopping, if the street is not more than thirty feet in width.

"SEC. 34. Whoever violates any provision of this chapter shall be punished by a fine not exceeding twenty dollars for each offence, and not only the person actually doing the prohibited thing, but also his employer and every person concerned in so doing, shall be punished by such fine.

"Police Manual.

"TRUCKS, WAGONS, ETC.

"SEC. 4. No owner, driver, or other person having the care or ordering of any licensed truck, cart, wagon, handcart, sleigh, sled, hand-sled, or other vehicle, shall suffer the same to stop in any street, square, lane or alley of this city more than five minutes, without some proper person to take care of the same, or more than twenty minutes in any case; and any person so offending shall be liable to a fine not exceeding twenty dollars for each offence.

"Every driver of any licensed truck, wagon, or other vehicle shall remain near to such vehicle while it is unemployed, or standing in the streets or squares of the city, unless he shall be necessarily absent therefrom in the course of his duty and business, and shall so keep his horse or horses, and his carriage or other vehicle, that they shall not obstruct the said streets or squares or other public passages in any other manner than is allowed by law, or the Ordinances of the City Council or Orders of the Board of Aldermen.

"RULES RELATING TO HACKNEY CARRIAGES.

"SEC. 2. The police commissioner may assign to any person or corporation licensed to set up and use a hackney carriage, a place as a special stand for such licensed carriage, and the owner or lessee of more than one licensed carriage may keep any one of his licensed carriages on said stand, when not occupied by another licensed carriage owned or leased by him.

"The police commissioner will, from time to time, designate certain places which shall be used as public stands, and may be occupied by any licensed hackney carriage, or by so many of said carriages as shall be allowed to stand thereon.

"SEC. 9. No owner, driver, or other person having the care or ordering of any licensed hackney carriage shall suffer the same to stop in any street, square, lane or alley of this city more than five minutes without some proper person to take care of the same, or more than twenty minutes in any place; provided, however, that nothing in this paragraph shall be taken to apply to licensed hackney carriages rightfully standing upon special or public stands.

"Every driver of any licensed hackney carriage shall remain near to such vehicle while it is unemployed, or standing in the streets or squares of the city, unless he shall be necessarily absent therefrom in the course of his duty and business as such driver; and shall so keep his horse or horses, and his carriage or other vehicle that they shall not obstruct said streets or squares or other public passages in any other manner than is allowed by law, or the ordinances of the city council, or orders of the board of aldermen.

"SEC. 12. Every person having charge of a hackney carriage shall obey the directions of any police officer respecting the standing of such carriage while waiting for passengers, and the route to be taken in going to or from the place of standing."

Our investigations indicate that the above regulations are continually infringed, and it seems practically impossible to enforce them with the number of police officers now available.

The growth of street traffic is roughly indicated by the number of hack and wagon licenses granted by the police department. It 1886 licenses were granted for 1,240 hacks and for 3,848 wagons; in 1906 the licenses for hacks numbered 1,506 and those for wagons 5,225; so that in the twenty-year period vehicles of those two classes increased from 5,088 to 6,731.

II. POSSIBLE REMEDIES AND EXPERIENCE IN OTHER CITIES.

The possible remedies for the conditions which have been described may be arranged under the following heads:—

- A. More comprehensive regulations.
- B. Street widenings.
- C. Freight subways.

A. REGULATIONS IN OTHER CITIES.

The following information relating to police regulations in other cities is instructive. The principal provisions of ordinances of other cities relating to the subject are as follows:—

"NEW YORK.

"Art. 1; Sec. 1. Vehicles must keep to the right, and as near the right curb as possible.

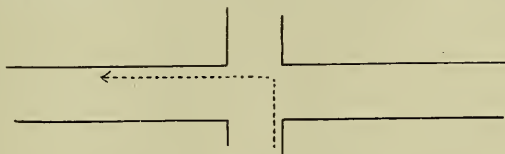
"Art. 1, Sec. 2. Vehicles meeting shall pass each other to the right.

"Art. 1, Sec. 3. Vehicles overtaking others shall, in passing, keep to the left.

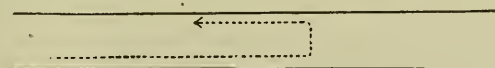
"Art. 1, Sec. 5. Vehicles in turning to the right into another street shall keep as near to the curb as practicable. Thus:—



"Art. 1, Sec. 6. Vehicles turning to the left into another street shall pass to the right of and beyond the centre of the street intersection before turning. Thus:—



"Art. 1, Sec. 7. A vehicle crossing from one side of the street to the other shall do so by turning to the left so as to head in the same direction as the traffic on that side of the street. Thus:—



"Art. 1, Sec. 8. No vehicle shall stop with its left side to the curb.

"Art. 1, Sec. 9. It shall not be lawful for any public cartman, or for any person driving or having charge of any public cart, wagon or other vehicle, to drive or back any such public cart or any other cart, wagon or other vehicle, into the sidewalk of any of the streets of said city, except as hereinafter provided, or to stop any such cart, or any other vehicle, on any of the crosswalks or intersections of streets so as to obstruct or hinder the travel along such crosswalks or intersection of streets,

or to place any such carts or other vehicles crosswise of any streets of said said city except to load thereon or unload therefrom; but in no case shall it be lawful for any person to permit such cart or other vehicle to remain so crosswise of any street for a longer period than may be actually necessary for such purpose; but it shall be lawful for the owner or occupant of any store, warehouse or building in any street or avenue in which the rails of any railroad company are laid so close to the curbstones as to prevent the owners or occupant from keeping any such cart or other vehicle in the carriageway in front of his place of business without interference with the passing cars of any such railroad company to occupy with such cart or other vehicle during business hours so much of the sidewalk as may be necessary for such cart or other vehicle provided that sufficient space be retained for the passage of pedestrians between the cart or other vehicle so permitted to occupy such portion of the sidewalk and the stoop or front of every such store, warehouse or other building. In no case shall it be lawful to place any such carts, wagons, or other vehicle crosswise of the carriageway on Broadway or Fifth avenue, south of 59th st., or on Park row, nor shall any such cart, wagon or other vehicle be permitted to remain in front of any premises on said Broadway or Fifth avenue, south of 59th st., or on Park row, unless placed in close proximity to the curb, with the side of such cart, wagon, or other vehicle parallel therewith.

"Art. 1, Sec. 10. In no case shall a vehicle remain backed up to the curb, excepting when actually loading or unloading.

"Art. 1, Sec. 11. Unless in an emergency or to allow another vehicle . . . or pedestrian to cross its path, no vehicle shall stop in any public street or highway of this city except close to the curb line.

"Art. 1, Sec. 12. No vehicle shall stop, for the purpose of taking or setting down a passenger or loading or unloading freight, or for any other purpose except in case of accident or other emergency, or when directed to stop by the police, in such a way as to obstruct any street or crossing.

"Art. 1, Sec. 13. No vehicle shall stop or stand within the intersection of any street, nor within ten feet of a street corner.

"Art. 1, Sec. 14. Surface cars shall stop on the far side of the street at the crosswalk to discharge or take on passengers.

"Art. 1, Sec. 15. On all public streets and highways of the city, all vehicles going in a northerly or southerly direction shall have the right of way over any vehicle going in an easterly or westerly direction.

"Art. 1, Sec. 17. Subject to the preceding section of this article, surface cars running on tracks laid in the streets especially for their use shall have the right of way along such tracks, between cross streets, over all vehicles moving in the same direction at a less rate of speed than ten miles an hour; and the driver of any vehicle proceeding upon the track in front of a surface car shall turn out as soon as possible upon signal by the motorman or driver of the car.

"Art. 1, Sec. 20. Vehicles moving slowly shall keep as close as possible to the curb line on the right, so as to allow faster moving vehicles free passage on the left.

"Art. 2, Sec. 4. No vehicle shall cross any street or avenue running north and south, or make any turn at a speed rate exceeding one-half its legal speed limit.

"Art. 4, Sec. 6. No public or private hack, while awaiting employment by passengers, shall stand in or upon any public street or place other than at or upon public or private hackstands, respectively, designated by the Board of Aldermen; nor shall any hackman seek employment by repeatedly and persistently driving his hack to and fro in a short space before, or by otherwise interfering with proper and orderly access to, or egress from, any theatre, hall, hotel, public resort, railway or ferry station, or other place of public gathering, but any hackman may solicit employment by driving through any public street or place without stops other than those due to obstruction of traffic, and may pass and repass before any theatre, hall, hotel, public resort, railway or ferry station or other

place of public gathering, provided that after passing such public place he shall not turn and re-pass until he shall have gone a distance of two blocks beyond such place.

"Art. 5, Sec. 1. Except as provided in this article, no horse or vehicle shall be driven, backed, led or allowed to stand on any sidewalk which has been curbed, except that wares or merchandise in process of loading and unloading, shipment, or being received from shipment, may be transferred from trucks or other vehicles over the sidewalk by the use of skids, or by backing up trucks on the sidewalks in so doing, provided a passageway be kept open within the stoop line of buildings for the free passage of pedestrians.

"PHILADELPHIA.

"Provisions 1, 2 and 3 are the same as in New York.

"Provision No. 4. Abutting property owners must not obstruct passenger railways by backing up their wagons while loading them, if they could by placing their wagons sideways to the pavement load them without unreasonable delay, trouble or inconvenience.

"Provision No. 5. No wagon, cart or other vehicle shall be allowed to stop in the center of any street for the sale or delivery of goods or merchandise or otherwise, but the same shall be stopped alongside the curb and on the right. Any violation of this ordinance shall subject the offender to the penalty of \$5 to be recovered as penalties are now by law recoverable.

"Provision No. 6. A hackney carriage or carriages where not actually employed shall not be kept standing in any other of the public highways of the city than those which may be assigned to them as stands, or stop in any street, square, lane, alley, or public place so as to obstruct the same, or the sidewalk, flagstones or crossings thereof.

"Provision No. 7. Other stands are established for 'furniture cars.'

"Provision No. 8. The following regulations refer to facilitating the traffic of Street Railways:—

"(a) Between the hours of 6.30 and 8.30 o'clock A.M. and between the hours of 4.30 and 7 o'clock P.M., no vehicle other than street railway cars shall be permitted to drive on the street railway tracks or the space between them on any of the streets of the city within the district between the Delaware and Schuylkill rivers and between Green street and South st., inclusive (except Dock st., from Second st. to 3d st.; Second st. from Dock st. to Noble st.; 3d st. from Dock st. to Callowhill st.; 4th st. from Walnut st. to Noble st.; Fifth st. from Walnut st. to Vine st.) Nor upon any diagonal street east of the Schuylkill river upon which double tracks are laid.

"(b) During said hours upon all of the said streets upon which a single track is laid no vehicle shall be allowed to stand on the righthand side of such streets (with reference to the direction the cars run) for a longer time than is actually necessary for the loading or unloading of said vehicle. Said sides of streets shall be kept free and clear for moving vehicles.

"(c) At all times and upon all streets the drivers of vehicles shall be required to pull off the track immediately upon the signal of a motorman if the car is approaching.

"In case of a breach of any of these regulations, the officer shall take the name and address of the driver and the name and address of the owner of the vehicle, and require the driver to be present the next morning at the station house to which such officer is attached, at the hour fixed for hearing.

"CHICAGO.

"Regulations are almost the same as those previously quoted for New York.

"At street corners where traffic is regulated by police officers using a whistle, one blast gives permission to teams to move north and south, and two blasts give permission to move east and west.

"ST. LOUIS.

"It is reported that there is no congestion in St. Louis. Seventeen police officers are detailed for the regulation of traffic, but their principal duty is to protect pedestrians, not to prevent congestion.

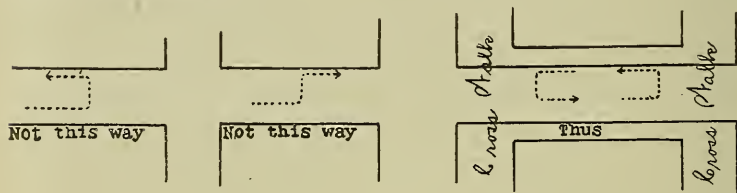
"CINCINNATI.

"Here the rules are almost the same as for New York.

"BUFFALO.

"The following regulations which have not thus far been mentioned are in operation in Buffalo:—

"1. Vehicles will not be permitted to turn in the center of a block; nor will they be permitted to cross from one side to the other side of the street within blocks; but they may cross the street at the end of blocks and inside of the crosswalks.



"2. Vehicles for the transportation of passengers to and from theatres, balls, parties or other functions, will stand in single file only, facing in the direction of traffic, next and close to the curb, unless otherwise ordered by a police officer.

"WASHINGTON, D. C.

"In Washington licensed vendors are assigned to designated places; are not allowed to ply their trade between 10 P.M. and 7 A.M., or at any time in such a way as to interfere with traffic; and they must keep the streets clean adjoining their stands.

"The hack stands are prescribed with the number of carriages at each.

"Two vehicles must not stop abreast.

"Vehicles following each other must have 15 feet between them.

"In other ways the provisions are similar to those previously quoted. One provision not before mentioned is that no vehicles shall have articles hung on the sides extending beyond the hubs, nor more than 10 feet to the rear of the rear axle, without permit.

"The regulations regarding markets are very complete. At the 'Wholesale Produce Market' definite places are assigned by the market master to farmers and gardeners who bring produce of 'their own raising.' They must obtain a permit, and pay in advance, not over 10 cents per day. Space is assigned on the roadway not to exceed 7 feet, or more than is necessary, or sufficient for the accommodation of one wagon backed against the curb; and the space to be occupied on the sidewalk must not exceed 5 feet from curb line. These stands are not to be occupied on Sundays or upon legal holidays, and not from 2 to 4 P.M. except on Saturdays, when they may be occupied until 4.30 P.M. Farmers occupying these stands must be on hand by 4.30 A.M. in the months from April to September, inclusive, and by 5 A.M. during the remainder of the year; otherwise, they are liable to forfeit the right to use the stand for that day. All barrels and boxes must be removed before 2 P.M., or 4.30 on Saturday. The market master makes daily collections, and renders a sworn statement weekly to the sealer of weights and measures."

B. STREET WIDENINGS.

If it were possible to carry out a system of street widenings throughout the congested district, much improvement would be effected. The following are the principal projects of this kind which have been suggested for north and south traffic. Unless otherwise stated, the new width between building lines is in each case 60 feet.

(1) Widen Exchange Street to a width of 40 feet, allowing for the passage of four teams abreast; take a strip from the building in Dock Square; widen Merchants Row between North Market and North streets, and North Street between Union and Blackstone streets.

This scheme is indicated on Plan No. 1.

The cost of this improvement has been estimated as follows:—

Exchange Street, ...	\$1,600,000
Dock Square block, ...	302,000
Merchants Row, ...	323,400
North Street, ...	356,000
	\$2,581,400

(2) A more extended scheme for street widening is shown on Plan No. 2, which consists in widening Endicott Street and extending it so as to form an almost straight street 60 feet wide to the corner of State and Congress streets. The plan also shows a slight widening of Union Street between Hanover and Washington streets.

The total cost of such a plan is estimated at \$5,161,250.

(3) Another plan for street widening is shown on Plan No. 3. This consists in widening Exchange Street; removing the block in Dock Square; taking a slice from the building on the south side of South Market Street, between Merchants Row and Exchange Street; and also widening Merchants Row between North Market and Union streets; North Street between Union and Blackstone streets; Friend Street between Union and Hanover streets; and Union Street between North and Blackstone streets.

The cost of this scheme is estimated as follows:—

Exchange Street and South Market Street, ...	\$2,562,000
Block in Dock Square, ...	565,500
Merchants Row, ...	323,400
North Street, ...	356,000
Friend Street, ...	745,000
Union Street, ...	466,900
	\$5,018,800

Of the various widenings which have been suggested, the following appear to be specially worthy of consideration:—

- (1) The widening of Exchange Street.
- (2) Taking a strip from the building in Dock Square or the entire building.
- (3) Widening Merchants Row between North Market and North streets.
- (4) Widening North Street between Union and Blackstone streets.
- (5) Taking a strip on the south side of South Market Street between Merchants Row and Exchange Street, or between Change Avenue and Exchange Street.
- (6) The widening of Friend Street.
- (7) The widening of Union Street.
- (8) The widening of Cross Street.

The Commission does not under present financial conditions advise carrying out any such widenings as above described. This conclusion is

enforced by the fact that there are various other ways in which there may be relief of congestion in the near future. Among these are the following:—

The greater use of motor vehicles in transporting merchandise.

The making and enforcing of new regulations controlling traffic in the streets, as herein recommended.

A reduction in the number of surface cars passing on Washington, Milk and Congress streets, across State, and on Devonshire Street north of State Street, upon the opening of the Washington Street tunnel.

A possibility, through action by railroad companies or otherwise, of a concentration of teaming interests, enabling the traffic to be carried with a less number of teams. The wastefulness of the present method is indicated by the figures previously given, showing the proportion of empty or partly loaded teams going to and from the freight stations.

The possibility of the construction of lines of small subways for the distribution of freight, as herein described.

The possibility of a connection of the Boston & Maine and the New York, New Haven & Hartford systems by a tunnel under the city, adapted to the passage of both passenger and freight trains

The right of taking by eminent domain, which previously had been limited to the land to be added to the street, was extended by chapter 443 of the Acts of 1904 so as to allow the taking of the whole of an estate, part of which only was needed for the widening. This extension of power is not infrequently insufficient to bring about the best results. If every estate of which only a part is needed for a widening is taken, the frontage on the street is thereby consolidated; but the depth of the land available for buildings is so reduced that no buildings of suitable size for an important thoroughfare can be constructed thereon. To lay out a broad avenue without at the same time continuing or creating conditions which bar its development as a great business or residential thoroughfare, may require that a district wide enough not only for the avenue but also for the construction of great buildings on either side of it should be taken. This would involve a very large original outlay; but the conditions are sometimes such that it is the only way in which a truly great public improvement can be realized. The constitutional justification of such a taking by eminent domain is found not in the fact that with a plan well conceived and honestly carried out it would be the most economical method, but in the fact that only by such method can the largest and most general public benefit be brought about. This subject was quite fully treated of in the able report of the committee, made to the Legislature in the year 1904, appointed under chapter 86 of the Resolves of the year 1903. The results which may follow the exercise of such larger powers as those above described are shown by the notable public improvement carried out in London, in transforming a district between Holborn and the Strand from a condition of narrow streets and alleys with narrow two and three story buildings of limited usefulness into a fine business district surrounding a broad avenue called Kingsway. It appears from the report of the Royal Commission on London Traffic that the gross cost of this vast improvement now completed is estimated at £1,866,000, and the net cost at £744,200.

C. FREIGHT SUBWAYS.

The business district of Boston, so far as its avenues of traffic north and south are concerned, somewhat resembles an hour glass, the narrow portion being that between Post Office Square and Haymarket Square. North and south of these points the radiating streets are sufficiently wide to accommodate the traffic; while between these points, especially in Congress, Exchange, Devonshire, Washington and Union streets and Merchants Row, there is congestion.

A subway for teaming traffic, from one end of this congested district to the other, would be sometimes blockaded by breakdowns and otherwise, unless it was sufficiently wide to accommodate at least three lines of teams.

This would call for a width of 30 feet. At the ends of such a subway it would be necessary to have either long inclines with grades of not more than 3 per cent., which would involve large expenditures for real estate, or else elevators, initially less expensive, but involving a heavy burden for operation.

The following rough estimates of cost of subways wide enough for two lines of teams have been made:—

LOCATION.	Cost of Subways.	Estimated Annual Cost, including Interest at 4 Per Cent., approximately.
(1) A teaming tunnel from Fort Hill Square to Haymarket Square, 2,950 feet long; estimated cost, including six elevators at each end, and equipment, land takings and damages, approximately.	\$2,500,000	\$165,000
(2) Tunnel from corner of Batterymarch and Custom House streets to Haymarket Square.	2,900,000	182,000
(3) Tunnel from McKinley Square to Haymarket Square.	2,450,000	164,000
(4) Tunnel from Dewey Square to Causeway Street, stations at Post Office Square, Dock Square and Haymarket Square.	4,000,000	335,000

The observations which the Commission has caused to be made indicate that about 4,000 teams pass State Street, in each direction, between Washington Street and Atlantic Avenue, per diem; or a total of 2,400,000 teams per annum of 300 days. At best, a subway for teams would relieve the streets only of those teams desiring to pass between points at or beyond the termini of such subway. It would not be used by teams desiring to go to or from intermediate points, or to or from points laterally even a short distance from the termini. There is no means of knowing how large a proportion of the 2,400,000 teams crossing State Street in a year would use such a tunnel as, for instance, that first described above; but if one-sixth of them should make use of it the expense to the city per team per passage would be over 40 cents. It seems improbable that the owners of teams would be willing to pay regularly any considerable sum for the privilege of passage through such a tunnel.

The figures indicate that the cost of the construction and operation of such a subway would not be justified by the relief afforded.

In Chicago a system of small subways under the streets at an average depth below the surface of about 45 feet has been constructed for the transportation of parcels and freight in small cars operated in a train service, sidings or spur tracks being provided for such establishments as desire to make use of the plant for the receipt and delivery of goods. Fifty-eight miles of such subways have been constructed. The amount of business done, except for the post office department and a few large mercantile establishments, is as yet inconsiderable. The opportunity for the installation of such a system in Chicago is more favorable than it would be in Boston. It is believed that such a system even in Boston would be more effective in relieving the streets than a subway for the passage of teams.

At the present time the Commission is unable to advise the construction and installation of such a system. It should not be undertaken until assurance is obtained of an adequate return in rental or otherwise.

Teaming Tunnel to East Boston.

Studies have been made with reference to the possibility of constructing a teaming tunnel to East Boston. Such a tunnel might be located on the present North ferry route, or from the present South ferry on the Boston side to the North ferry in East Boston.

Designs and estimates have been made for such a tunnel, to accommodate two lines of teams with a narrow sidewalk on each side. If such a tunnel were placed with its crown 45 feet below mean low water at harbor commissioners' line, the roadway would be 75 or 80 feet below Atlantic Avenue; and to approach such a tunnel by an incline, would require a length of 4,000 feet with a 2 per cent. grade, or 2,000 feet with a 4 per cent. grade; the latter, however, would be too long and steep for heavy teams. If the grade were 3 per cent., the length of the incline would be 2,600 feet, which would bring the entrance to the tunnel so far away that it would be of little use. The only other arrangement for entrance to a teaming tunnel would be by elevators. Such a tunnel has been built under the river in Glasgow. An elevator service similar to that at Glasgow (see Appendix B)) would have a capacity of approximately 4,000 teams per day of twelve hours, provided eight elevators could be used at each end. An escalator such as that which has been built in Cleveland would handle a larger number.

Our engineers have estimated that the cost, exclusive of land damages, of constructing such a tunnel located on the present North ferry route, with elevators and other equipment, the length being about 2,250 feet, would be about \$1,600,000, and the annual cost of operation, including interest at 4 per cent., would be about \$150,000.

Taking an alternative route from the South ferry on the Boston side to the North ferry on the East Boston side, with a length of 2,800 feet, the total estimated cost, exclusive of land damages, is about \$1,750,000, with an annual cost for maintenance of \$155,000.

Details of the traffic over, and cost of operation of, the East Boston ferries will be found in Appendix C.

Such a tunnel would be subject to blockades. The use of the elevators and the passage through the tunnel, which would be measured by the speed of the slowest teams, would upon an average, take as much time as is now taken for the ferry service. If a toll were charged, the teamsters would probably prefer the ferry service except in severe and foggy weather. It seems quite unlikely that the construction of such a tunnel would justify the discontinuance of one of the present ferries.

III. SUMMARY AND RECOMMENDATIONS.

The following conclusions have been arrived at:—

(1) Owing to the limited use which would probably be made of tunnels for teaming, either within the limits of the city proper or between the city and East Boston, the Commission does not recommend their construction.

(2) For reasons heretofore given, the Commission does not at the present time recommend any street widenings.

The Commission makes the following recommendations:—

(1) The tracks and pavements of Atlantic Avenue should be put in good condition, the snow should be removed as promptly as possible, and the endeavor should be made to reduce to a minimum the obstructions due to the switching of freight cars to and from the wharves, markets and warehouses.

(2) An effort should be made to secure, either by voluntary action or compulsory regulation, the separation on certain routes of the heavy teaming traffic from the light teaming traffic, particularly where there are bridges of different grades, as between the city proper and Charlestown, the more level routes being assigned to the more heavily loaded teams.

(3) The endeavor should be made to increase the percentage of fully and nearly fully loaded teams in and out of the railroad freight stations. Some improvement in this direction may perhaps be possible if concerted action or greater co-operation could be brought about between the teaming interests, or if the railroad companies should assume the teaming business themselves.

(4) Curb markets, as now maintained under authority of law, constitute in some streets an undue interruption to teaming traffic and add to the congestion of the streets. In the interest of a freer movement of traffic, they should be more restricted than at present.

(5) Express offices should be required to procure licenses from some designated authority, and in granting these licenses such offices should be allowed only on comparatively broad and little-travelled streets, where street cars do not run. It is particularly recommended that no such offices should be allowed in Merchants Row, Union Street or Devonshire Street.

(6) Permits for stands for teams or carriages should not be granted upon any of the congested teaming streets.

(7) Street cars on Atlantic Avenue should not be allowed to stop at the corner of Congress Street. The corner of Pearl Street, where a stop may be made, is only a short distance away.

(8) The hours of delivering coal and ice and collecting refuse in Winter Street, Temple Place, West Street and some other narrow streets should be limited to the hours before 9 A.M. and after 5 P.M.

(9) Traffic regulations with reference to unloading from teams backed up to the sidewalk, to stopping teams abreast, to teams passing each other, to stopping on the proper side of the street and to the general regulation of traffic should be more stringently enforced. The Commission is informed that to do this so as to effectively relieve congestion will require additions to the police force.

(10) There should be more stringent regulations in regard to the use of streets during the erection of new buildings, and to the opening of streets by public-service corporations. More of this work might be done during the night, and when practicable it should be forbidden in the congested district in the hours of greatest traffic.

(11) A regulation should be made requiring traffic on Winter Street to move only in one direction, and traffic on Bromfield Street only in the opposite direction. A copy of a communication of the Police Commissioner to the Board of Aldermen, recommending such regulation, will be found in Appendix E. Similar regulations might well be made covering certain streets in the market district.

(12) Some additional regulations which are in force in New York would prove desirable in the congested district, such, for instance, as the following:—

Vehicles turning to the left into another street shall pass to the right of the center of the street intersection before turning.

No vehicle shall stop with its left side to the curb except in streets in which the traffic is only allowed to pass in one direction.

Unless in a blockade, or emergency, or to allow another vehicle or pedestrian to cross its path, no vehicle shall stop in any street except close to the curb line.

Vehicles moving slowly shall keep as close as possible to the curb line on the right, so as to allow moving vehicles free passage to the left of them.

(13) The present ordinances, regulations of the board of aldermen and rules of police relating to street traffic should be collected and published in convenient form for the information of the public.

(14) At present the power to regulate street traffic, except so far as controlled by statute, is divided between four public authorities: the City Council, which enacts ordinances; the Board of Aldermen, which passes regulations; the Street Commissioners; and the Police Commissioner. To secure the best regulation of traffic it seems to be requisite that the control of the whole matter should be concentrated in such single or combined authority as by reason of experience and broad familiarity with the subject may be specially qualified to act promptly, effectively and wisely.

The detailed work of preparing the data for this report, superintending the counts of traffic, etc., has been done under the direction of our chief engineer, Mr. Howard A. Carson, by Profs. W. E. Mott and George E. Russell, of the Massachusetts Institute of Technology. Our thanks are due to all of these gentlemen for the efficient service which they have rendered, and also to the officials of various cities, both in this country and abroad, who have kindly furnished information.

GEORGE G. CROCKER,
THOMAS J. GARGAN,
GEO. F. SWAIN,
HORACE G. ALLEN,
JOSIAH QUINCY,

Boston Transit Commission.

APPENDIX A.

ACTS OF 1907, CHAPTER 584.

AN ACT RELATIVE TO THE USE OF PUBLIC STREETS IN THE CITY OF BOSTON FOR THE STORAGE AND SALE OF MERCHANDISE.

Be it enacted, etc., as follows:

SECTION 1. The board of street commissioners of the city of Boston may issue, under the conditions hereinafter provided and under rules of its own not inconsistent herewith, licenses for the use of specified parts of public streets in said city for the storage and sale of merchandise.

SECTION 2. A person seeking such a license shall file with said board a written application therefor, stating his name, age, occupation, residence and place of business, if any, and whether or not he is a citizen of the United States or has declared his intention to become such. He shall describe accurately in writing, by plan or otherwise, the location, the shape and the dimensions of the space which he desires to occupy, the movable structures which he proposes to use, and the kinds of merchandise which he wishes to store and to sell. He shall submit as part of his application the written consent to the issuance of the said license on the part of the owner or owners of the premises in front of which he desires to carry on business and of the tenants of the ground floor of such premises, or in lieu thereof the written consent of the duly authorized agent or agents of such owners and tenants. When the privilege for which a license is asked is to be exercised in front of premises owned by the city of Boston, the owner's consent herein provided for may be given by the department having charge of said premises. An application from a firm or a corporation shall be made by such partners or officers and under such further conditions as the board shall determine, and every partner or officer so designated shall give concerning himself the information as to age, occupation, citizenship, residence and place of business which is required of an individual applicant.

SECTION 3. The application shall be sent by the board of street commissioners to the police commissioner of the city of Boston, with a request for a report thereon. It shall be the duty of said police commissioner forthwith to examine in person or by means of his subordinates

the location for which the license is asked, with particular reference to the effect of its use as desired upon the free passage of vehicles and of foot passengers and upon the maintenance of public order. In his report to the board of street commissioners, which shall be made as soon as practicable, he may certify his approval or his disapproval, or his approval conditional upon amendments to be made in the application as affecting the precise location, its area or the kinds of merchandise to be stored and sold thereon.

SECTION 4. Should the board of street commissioners and the police commissioner agree as to the propriety of issuing a license, the authority for further action shall be vested in said board; but no license shall become effective until twenty-four hours after a copy thereof has been delivered to the police commissioner.

SECTION 5. A license issued by the board of street commissioners may be for one or more week days in each week, for such hours daily as it shall in each case determine, and for any period not exceeding twelve months. It may be renewed on an application conforming to the conditions and in accordance with the procedure prescribed in sections two, three and four of this act. It may be suspended or revoked for any reason which said board shall consider sufficient.

SECTION 6. For each license issued and for each renewal thereof the board of street commissioners shall charge and collect in advance a fee of not less than five dollars nor more than one hundred dollars, according to its estimate of the value of the privilege granted, the receipt of which fee shall be certified on the face of the license. It may make and collect an additional charge as rent whenever the licensee is not the principal tenant of the ground floor of the premises in front of which the location is granted; or whenever such tenant is the licensee but carries on in the location for which the license is issued a business which in the manner of its conduct or in the character of the merchandise which is sold differs materially from the business in which he is mainly engaged at that place.

SECTION 7. The board of street commissioners shall cause to be kept at its office full and accurate records of its doings under this act, open to the public under reasonable restrictions, and at all times to the mayor of the city or to such persons as he may designate. Separate accounts shall be kept of moneys received from licenses and from rentals derived from the use of parts of the public streets. Employees of the board entrusted with the receipt or the custody of such moneys shall be required to give bonds for the faithful performance of their duties to such amount in each case and of such character as the board shall determine. Moneys received under the provisions of this act shall be paid over to the city collector weekly, or more frequently, with a statement in detail of the sources from which they were derived; and the collector shall give his receipt therefor. The board shall include in its annual report a reasonable summary of its doings under the authority of this act.

SECTION 8. Requirements and prohibitions contained in this act or elsewhere to the contrary notwithstanding, it shall be lawful to occupy without license or fee places in the streets, not including sidewalks, within the limits of Faneuil Hall Market, as the same are or may be defined in the ordinances of the city of Boston, and other market limits added under authority of chapter three hundred and seventy-six of the acts of the year eighteen hundred and ninety-six, for the sale from wagons or other vehicles of fresh provisions and perishable produce: *provided*, that the same are the product of the farm of the person offering them for sale, or of a farm within ten miles of the residence of such person; or are to be sold at wholesale only by the party offering the same for sale on commission, for, or as agent for, some person or persons not residing or having a usual place of business within eight miles of said market; or are meats to be sold at wholesale only by the person who slaughtered the animals of which the same were a part. Such sales shall be lawful only on days on which Faneuil Hall Market is open. Nothing contained in this section shall be construed to repeal or prevent reasonable rules of police, needful for

the decorum, convenience and good order of the market, and of those who buy and sell therein.¹

SECTION 9. The police commissioner of the city of Boston may designate from time to time certain streets, or parts of streets, or sections of the city wherein, and not elsewhere in the city, it shall be lawful on the days and within the hours specified by him, and under such general rules as he shall make, for any hawker or pedler, without the license provided for in this act, to stop or stand for the purpose of selling merchandise: *provided*, that such hawkers or pedlers carry on their business in conformity with the laws of the Commonwealth, the ordinances of the city, and the regulations of the board of aldermen and of the board of health of the city of Boston, now or hereafter enacted and not inconsistent herewith.

SECTION 10. A person who occupies a part of a public street in the city of Boston for the purchase, sale or storage of merchandise from a stand, from a vehicle or on foot, except in accordance with the provisions of this act shall be subject to a fine not exceeding twenty dollars for the first offence and not exceeding one hundred dollars for each subsequent offence, and should such person be unknown to the police officer witnessing such occupation he may be arrested by such officer without a warrant.

SECTION 11. Chapter two hundred and eleven of the acts of the year eighteen hundred and fifty-nine, chapter one hundred and fifty-two of the acts of the year eighteen hundred and sixty, and all other acts, ordinances and regulations inconsistent herewith are hereby repealed and annulled. [*Approved June 28, 1907.*]

APPENDIX B.

GLASGOW HARBOR TUNNEL.

The Glasgow harbor tunnel is a tunnel under the river for the use of teams, with elevators at each end. It consists of three circular tubes, two for vehicles and one for passengers, entering the central shaft at each end. The section of each tube is circular and 16 feet in diameter, allowing the passage of one team. The finished diameter of the shaft is 76 feet, and the bottoms of the shafts are about 75 feet below street level. In each shaft there are six elevators, three for elevating and three for lowering, operated by hydraulic pressure, at 750 pounds per square inch. The toll is one-quarter penny per passenger, threepence for loaded teams and twopence for unloaded teams, the annual revenue from passengers being \$8,500, and from teams about the same. The total cost of installation was about \$1,450,000. The weekly wages amount to a little less than \$200. The elevators are capable of handling at each end 90 teams per hour each way, or about 1,000 teams each way per day of twelve hours.

This tunnel is a private enterprise, and is reported not in operation at present.

APPENDIX C.

EAST BOSTON FERRIES.

The following table gives data regarding the cost of operating the ferries:—

1. *Ferry Service (Both Ferries).*

Gross cost of operating both ferries (annual report for 1905-06),	\$295,000 00
Gross cost of operating per day ($\$295,000 \div 365$),	809 00
Average daily number of teams, both ferries,	2,460
Gross cost to carry one team, assuming that gross cost would not be reduced if foot passengers were not carried ($\$809 \div 2,460$),	\$0.329

¹ See City Ordinances, c. 47, § 61, *supra*.

2. *Tunnel Service.*

Gross cost of operating tunnel, ...	\$150,000 00
Gross cost per day operating tunnel, ...	410 00
Average daily number of teams now carried on North Ferry, ...	1,430
Gross cost to carry one team, ...	\$0.286

The following statistics are for the calendar year 1906:—

	North Ferry.	South Ferry.	Total.
Number of teams of all kinds carried in the year 1906, ...	527,701	380,974	908,675
Average daily (365 days), ...	1,445	1,043	2,488
Average daily by months (including Sundays and holidays):—			
January, ...	1,330	907	2,237
February, ...	1,311	910	2,221
March, ...	1,404	908	2,312
April, ...	1,391	1,012	2,403
May, ...	1,442	1,140	2,582
June, ...	1,480	1,171	2,652
July, ...	1,468	1,103	2,571
August, ...	1,513	1,214	2,727
September, ...	1,515	1,066	2,585
October, ...	1,603	1,141	2,744
November, ...	1,524	1,065	2,589
December, ...	1,357	880	2,237

No figures are available giving the maximum number carried during any one day.

The financial results of the operation of both ferries for the year 1906 was as follows:—

Tolls from both ferries for 1906 amounted to	\$103,872 28
Yearly appropriation by city, ...	243,000 00
Deficit, ...	139,127 72
Appropriation for coal pockets, ...	25,000 00
Extra appropriation, ...	20,000 00
Interest on ferry bonds and other charges, ...	20,578 01
Total deficit, ...	\$204,705 73

These two ferries attempt a regular running schedule of ten boats an hour each way. Five boats are in regular service, three at the North ferry and two at the South ferry. At the North ferry boats run nominally every six to seven and one-half minutes between the hours of 6 A.M. and 10 P.M., and every fifteen minutes between 10 P.M. and 6 A.M. At the South ferry a seven and one-half minute schedule is maintained between 6 A.M. and 10 P.M. The running time from slip to slip is from two to two and one-half minutes, and the average capacity of the boats is about 12 teams. During the rush hours, from 7 to 9 A.M. in East Boston and from 5 to 7 P.M. in Boston proper, the boats seem unable to accommodate all the traffic, and not infrequently from 30 to 50 teams may be found waiting in line on Atlantic Avenue.

Statistics of Business of the City Ferries between Boston and East Boston.

	1901-02.	1902-03.	1903-04.	1904-05.	1905-06.	1906-07.
Passengers per annum, ...	12,395,649	12,923,734	13,213,559	13,200,033	6,708,152	6,292,393
Teams per annum, ...	917,224	931,281	914,210	947,917	894,454	1,052,236
Total receipts from foot passengers, ...	\$121,697	\$126,928	\$131,621	\$129,976	\$65,238	\$60,347
Total receipts from teams and passengers thereon, ...	43,102	43,189	43,058	43,565	41,391	41,241
Total receipts turned over to city collector (rents included), ...	167,880	173,190	177,507	176,149	108,478	104,802
Total expenditures (regular and special appropriations, but excluding accounts transferred), ...	290,742	296,979	295,869	256,126	273,715	290,464
Difference of last two items, ...	122,862	123,789	118,361	81,977	165,237	185,661
Net capital investment by the city, ...	3,198,987	3,337,780	3,473,086	3,571,933	3,754,091	3,957,179

Total expenditures by the city since 1898-99, ...

\$9,899,281 75

Total receipts by the city since 1898-99, ...

6,145,191 03

\$3,754,090 721905-06 receipts, North ferry,
Foot passengers, ...

\$58,150 18

Teams, ...

\$35,000

1905-06 receipts, South ferry,
Foot passengers, ...

47,644 07

Teams, ...

\$30,000

17,000

The busy days for the boats are every other Tuesday, these being the days on which the Cunarders sail; and Friday is also heavy, being market day. The hours of heaviest traffic in Boston are from 7 to 9 A.M. and 3 to 5 P.M.

The passenger business of these ferries has fallen from approximately 13,000,000 to 6,000,000 per annum since the opening of the East Boston tunnel.

APPENDIX D.

HAWKERS AND PEDLERS.

CITY OF BOSTON, POLICE DEPARTMENT,
OFFICE OF THE POLICE COMMISSIONER, Dec. 17, 1907.

In accordance with the provisions of section 9, chapter 584, Acts of 1907, I hereby designate the streets, parts of streets and sections of the city of Boston wherein, and not elsewhere in said city, it shall be lawful for hawkers and pedlers to stop or stand for the purpose of selling merchandise: *provided*, that such hawkers or pedlers carry on their business in conformity with the laws of the Commonwealth, the ordinances of the city, and the regulations of the Board of Aldermen and of the Board of Health of the city of Boston not inconsistent with such laws or with the following rules hereby established under their authority:—

1. For the purposes of these rules the area comprised within the following streets and squares and all others included within them as boundaries shall be called the "Business Section:"—

Haymarket Square; Canal Street; Causeway Street, between Canal and Portland streets; Portland Street, between Causeway and Chardon streets; Chardon Street; Bowdoin Square; Court Street; Pemberton Square; Somerset Street, between Pemberton Square and Ashburton Place; Ashburton Place; Bowdoin Street, between Ashburton Place and Beacon Street; Beacon Street, between Bowdoin and Park streets; Park Street; Tremont Street, between Park and Boylston streets; Boylston Street, between Tremont and Dartmouth streets; Tremont Street, between Boylston and Eliot streets; Eliot Street, between Tremont and Washington streets; Washington Street, between Eliot and Essex streets; Essex Street; Atlantic Avenue, between Essex and Clinton streets; Clinton Street, between Atlantic Avenue and Blackstone Street; Blackstone Street, between Clinton Street and Haymarket Square.

2. That part of the city proper lying outside the "Business Section" and north of a line formed by the tracks of the Boston & Albany Railroad and Summer Street from Dewey Square to Dorchester Avenue shall be known as the "Restricted Territory."

3. In all parts of the city excepting the "Business Section" and the "Restricted Territory" hawkers or pedlers may carry on their business at reasonable hours, subject to conditions herein prescribed, with vehicles drawn by horses or on foot, with trays, baskets, hand-carts, barrows or other easily movable appliances.

4. In the "Restricted Territory" they may carry on business at reasonable hours; but between 8 A.M. and 6.30 P.M. they may use only vehicles drawn by horses, or drays, baskets or other appliances not in the nature of stands, carried by the persons using them.

5. In the "Business Section" they may carry on business only before 8 A.M. or after 6.30 P.M., with the following exceptions:—

Between 3 P.M. and 11 P.M. on Saturdays, and on the week day immediately preceding Christmas Day and Thanksgiving Day respectively they may stop and stand, subject to the direction of the police, for the sale of merchandise other than fresh fish, fresh meat or fresh meat products,

outside the curbstones in the following streets; Blackstone Street, between Haymarket Square and North Street, both sides; North Street, between Blackstone and Union streets, west side; Merchants Row, between North and North Market streets, west side; North Market Street, between Merchants Row and Faneuil Hall Square, north side.

Before 8 A.M. and 6.30 P.M. on ordinary days and at the times and places specified in the next preceding paragraph of this rule hawkers and pedlers in the "Business Section" may use the same kinds of vehicles and other appliances as are permitted in the same periods of the day outside the "Business Section" and the "Restricted Territory."

6. Except as specified in the second paragraph of Rule 5, no hawker or pedler, unless licensed at a designated stand by the Board of Street Commissioners of the city of Boston, in accordance with the provisions of chapter 584, Acts of 1907, shall in a public street and while offering merchandise for sale remain in one place or within 200 yards thereof for more than five minutes, unless actually engaged in selling to a purchaser. This rule shall not be so construed as to prohibit hawkers and pedlers from proceeding, as their present practice is, from house to house and stopping thereat, even should such houses be less than 200 yards apart, for the purpose of inquiring whether or not their goods are desired by the residents.

7. Hawkers and pedlers may make reasonable announcement of the merchandise which they have for sale, but loud outcries likely to disturb or annoy other persons will not be permitted at any place or time.

8. The selling of newspapers and other periodical publications at retail in the public streets shall not be restricted by these rules, except that Rule 7 shall apply to persons so engaged, and that no stand or other appliance encroaching upon a public street shall be maintained without a license from the Board of Street Commissioners.

These rules shall take effect Dec. 30, 1907, and shall be in force thereafter except as they may be revoked or amended from time to time.

STEPHEN O'MEARA,

Police Commissioner for the City of Boston.

APPENDIX E.

CITY OF BOSTON, POLICE DEPARTMENT,
OFFICE OF THE COMMISSIONER, NOV. 19, 1906.

To the Honorable the Board of Aldermen.

GENTLEMEN:—I beg to acknowledge the receipt, through the assistant city clerk, of an order passed by your Board October 22, which requests the Police Commissioner "to consider the expediency of adopting some method of relieving the congestion of traffic on Winter Street and Temple Place."

In order that my answer to your request might be based upon personal observation, I have studied these streets on many days and at different hours of particular days. I shall speak especially of Winter Street, with the understanding that, except for certain local peculiarities easily to be identified, and except that Temple Place is wider and not so crowded, general conditions in the two streets are substantially alike.

The worst point in Winter Street, as seen by me, is at and near the entrance to Jackson Place. The particular trouble there is caused by the slow and awkward backing in of wagons on business of the abutters on the place, which is private, and their return to Winter Street. This trouble is much increased by the presence of a push cart loaded with fruit, which has a stand on the private property at the entrance to the place. When a

wagon is to enter or to leave, the fruit pedler is forced to push into Winter Street, and there to maneuver with his cart among the crowding vehicles until his stand is once more clear. This obstacle can be removed only by the abutters, to whom the pedler, I learn, pays as rent \$10, \$15 and \$25 a month, respectively.

The roadway of Winter Street is barely the width of three wagons; and, as vehicles stand at the curbs at all hours of the day, sometimes in almost unbroken lines, other vehicles which must move between them on a single track and in two directions are forced to swing from side to side in order to pass, taking advantage of any unoccupied spaces at the curbs. Relief of the street requires that the number of both the standing vehicles and the moving vehicles should be reduced.

Winter Street, moreover, though narrow and but a block in length, is used not only as a thoroughfare between Washington and Tremont streets, and as a means of access to buildings in the street itself, but as an artery for a traffic which in a sense is not its own. Business houses in Washington Street are served through Jackson Place; Music Hall Place and Winter Place have no other exit or entrance for vehicles; establishments fronting on Tremont Street have rear doors on a 5-foot alley, through which they receive and deliver goods and supplies and discharge their waste. It is in Winter Street that wagons for all these purposes center and stand; and, though the right of entrance to their premises cannot be taken from the tenants of those dependencies, the manner in which that right is exercised may and should be regulated.

Speaking now of the hours between 10 in the morning and 6 in the evening, it is clear that the present attempt is to put a quart of business into a pint of space. If the public and especially the tenants in the street insist upon carrying on their operations as if they had a boulevard to work in, and if their insistence is not modified by public decree, there can be no relief. But if by competent authority certain parts of the traffic can be excluded within the hours which I have named, the street can be made to carry its legitimate business and something more.

The traffic may be divided roughly into four classes:—

1. Vehicles which have no business to transact in Winter Street, but use it as a thoroughfare.
2. Vehicles which bring in supplies for the tenants in the street, and remove their waste.
3. Vehicles which bring goods in cases or other heavy or bulky form.
4. Carriages of shoppers, and many express wagons which take and deliver a great number of comparatively small packages.

Carriages and express wagons having business in the street itself should be allowed to come and go at all times. They are essential to the prosperity of the tenants, and their hours cannot be regulated. But I have seen the street in all parts of the day cumbered with clumsy vehicles carrying supplies for tenants,—not merchandise sold or for sale,—and removing waste material. I have never visited the street in the middle of the forenoon or of the afternoon without finding in it ice carts, milk carts, wagons delivering ice cream, butter and similar commodities, and large private vans removing empty packing cases or waste paper in bales, thirty or forty to the load, and collected from store to store.

The simplest methods of relief, in my opinion, are these:—

1. To prevent the delivery between 10 A.M. and 6 P.M. of supplies, such as ice, milk, coal, etc., or of goods in heavy packages.
2. To prevent between the same hours the removal of ashes, garbage, refuse, waste paper, empty packing cases and other wrappings. As I have never seen a city cart in the street in the busy hours, I do not doubt that the city's work is done at proper times.
3. To exclude automobiles.

If it should be necessary to take further and more radical action, one of these two expedients might be chosen:—

1. To order that vehicles should enter only at Tremont Street or at Washington Street, and proceed only east and west;
2. To exclude all vehicles except those having business in the street.

The first of these methods would require a corresponding though reversed order for Temple Place. The second would affect only Winter Street directly, but would be more difficult of enforcement. Either would compel vehicles in a large proportion of cases to take roundabout ways to reach their destinations, and might in that way create new difficulties in Temple Place and Bromfield Street, and even in Summer, Avon and Bedford streets. It is certain that the effect would be to add largely to the aggregate of miles travelled in crowded streets by vehicles seeking to pass through or to do business in Winter Street and Temple Place; but whether or not the avoidance of present delays would make up for the longer haul is a question which should be submitted to a more thorough and authoritative investigation than I am able to make.

Assuming that any of the suggestions which I have offered should be approved by the judgment of the Board of Aldermen or of the City Council, the question of authority remains to be considered.

The Police Commissioner has no power by law, ordinance or regulation to do any of the things herein suggested. A policeman has the right to stop or otherwise to order a particular vehicle at a particular time; but there is no authority in the Police Commissioner to lay down broadly or in advance rules which shall limit the traffic in a street or in any number of streets to one direction or another, or shall exclude particular kinds of vehicles from any street altogether or even at certain hours. All such authority, however, as I understand the case, may be exercised possibly by the Board of Aldermen, certainly by the City Council.

I am not a lawyer, but I have studied the legal side of this matter enough to become convinced that it is not for me to discuss here. I beg to assure you, nevertheless, that, by whatever means the city authorities shall seek to relieve the over-pressure of traffic in these or in other streets, and whatever may be the form of the new legislation, the police department will do the work assigned to it, to the full limit of its strength and of such power as shall be conferred upon it.

I hold myself personally at the continued service in this matter of your honorable body or of the City Council.

I am, with great respect,

STEPHEN O'MEARA,

Police Commissioner for the City of Boston.

APPENDIX E.

The names of all the assistants in the Engineering Department who have been employed for more than one month during the last year, together with an indication of the work on which they have been engaged, are given below. Those marked * left the employ of the Commission during the year.

OFFICE ASSISTANTS, JUNE 30, 1908.

Assistant Engineers.

EDMUND S. DAVIS,	Oversight of office and field work.
WILLIAM W. LEWIS,	{ Studies, preliminary estimates, designs for structures and contract plans.
*RALPH H. STEARNS,	
LEONARD B. HOWE,	{ Designs for steel work and concrete structures.
GEORGE H. STEARNS,	
RUSSELL L. ELLIOT,	
CHARLES H. BARTLETT,	
CHAUNCEY R. PERRY,	
*EDWARD H. ROCKWELL,	{ Specifications, estimates, etc.
JOHN S. HODGSON,	

Draughtsmen, etc.

WILBUR W. DAVIS,	{ Plans for tunnel work and structures.
GEORGE P. GOODMAN,	
†IRA B. GOODRICH, JR.,	
ROY M. LOTHROP,	
RUDOLPH J. THANISCH,	{ Details for steel work.
EDMUND A. RICE,	
SAMUEL C. LYMAN,	{ Rodmen; tracing, etc.
*RALPH KELLY (T),	
*SAMUEL A. GRAHAM (T),	
*LEO S. STONE (T),	{ Photographer and assistant for purchasing supplies.
FREDERIC W. STILES,	

FIELD ASSISTANTS.

Assistant Engineers.

P. F. O'BRIEN	Sections 5, 11 and 12.
ROBERT B. FARWELL,	Sections 6, 8, 10 and 11.
G. DANA EMERSON,	Interior finish, Milk, State and Union-Friend Stations; ventilation ducts; investigations, etc.
LAURENCE B. MANLEY,	Pipe changes; interior finish; tiling, etc.

† Began work June 22, 1906. Died July 7, 1907.
(T) Employed at first on observation of traffic.

WILLIAM O. WELLINGTON,	Entrances and exits at Summer and Winter streets; stairways in State Station; sub-passageway at Travers street; tunnel work under Relief Hospital.
JAMES T. FRAME,	Entrance and exit at Hayward place; interior finish.
C. LEONARD BROWN,	Entrance and exit, Boylston street; concrete work inside tunnel.
*CHARLES P. LOVELAND,	Section 6.

Transitmen.

JAMES B. FLAWS, RALPH C. MCPHERSON,	} Transitmen on line and grade work.
*ROY C. AIKEN,	
*THOMAS F. DORSEY (T) ,	} Transitmen whose duties have largely been inspecting construction work under the supervision of the assistant engineer on the ground.
*AUSTIN E. JOYCE,	
*ARTHUR E. LUCY,	
LEON R. VAUGHN,	

Rodmen.

FREDERICK F. MURPHY,	} Line and grade work.
*JOHN T. TOBIN,	
*JAMES J. TOBIN,	
HENRY N. HAYWARD,	
*OLIVER Y. LEONARD (T),	} Line and grade work; assisting the inspection on construction work.
*HARRIS J. NELSON,	
HYMAN LEFTOVITH,	
MOSES L. BROWN,	
*PETER J. RAFTUS,	} Same as above; also on experimental work, etc.
ARTHUR V. LYNCH (T),	
FRANK W. BURNHAM,	
PHILIP B. WALKER,	
*HUDSON B. HASTINGS (T),	} Rodmen whose duties have largely been inspecting construction work under the supervision of the assistant engineer on the ground.
FREDERIC W. FLETCHER,	
*CHARLES J. RYCROFT,	
*RAYMOND D. FALES,	
JOHN J. HURLEY,	} Messenger.
*CLARENCE E. EBERT,	
*THOMAS H. KEENAN,	
FRANK H. SCHOENFUSS,	
*ARTHUR J. SCHOENFUSS,	} Testing cement, pitch and other material; also superintending making of concrete sheeting, etc.
*AVERILL D. CARLISLE,	
ALFRED W. PARKER,	
	} Assistant cement testers.
	Inspector of steel work.

SECRETARY TO CHIEF ENGINEER, STENOGRAPHERS, ETC.

ARTHUR B. CARTER,	Secretary and Executive Clerk to the Chief Engineer.
ROSE A. McMAHON,	Stenographer.
DAVID J. DONAHUE,	Messenger and Stenographer,
JOSEPH P. SHEERIN,	Messenger and Stenographer,
MICHAEL J. PENDERGAST,	Messenger and Stenographer.
CHARLES E. FAY,	Messenger in draughting-room; blue-printing; care of plans.

(T) Employed at first on observation of traffic.

TEMPORARY ASSISTANTS ON TRAFFIC INVESTIGATION.

In addition to those having "T" against their names in the foregoing list, the following were employed in the summer of 1907 on street traffic investigation:—

WILLIAM E. MOTT,		Assistant Engineer.
GEORGE E. RUSSELL,		Assistant Engineer.
SERANUS H. BOWEN,		Stenographer.
FRANCIS J. MURPHY,		Transitman.
LEMUEL S. CANNING,		Rodman.
ELMER L. FORD,		"
JAMES E. GARRATT,		"
AUSTIN B. HENDERSON,		"
ELMER JACOBS,		"
LAURENCE R. KELLY,		"
EDRIC B. SMITH,		"
ARTHUR H. WHITMAN,		"

APPENDIX F.

WASHINGTON STREET TUNNEL.—CANVASS OF BIDS FOR CONSTRUCTING ENTRANCES AND EXIT AT WINTER STREET.—BIDS OPENED JULY 18, 1907.

BIDDERS AND ADDRESSES	2,000 cubic yards Earth Excavation.	Removing and disposing of 100 cub. yards of masonry in cellar floors, walls, foundations, etc.	Furnishing, hauling and putting in place for all purposes other than Item (c), 800 cub. yds. Portland concrete	Furnishing, hauling and putting in place, where shown on the contract plans, 40 cub. yds. Portland concrete	Furnishing and putting in place 150 square yards of granolithic surface, 1 inch in depth.	Furnishing and laying 10 cub. yds. of Portland brick masonry	Laying 70 lin. ft. of 24-inch vitrified pipe, furnished by the Commission	Laying 70 lin. ft. of 3-inch and 4-inch vitrified pipe, furnished by the Commission	Laying 20 lin. ft. of 6-inch, 8-inch and 10-inch vitrified pipe, furnished by the Commission	Setting in place and securing 25 tons of steel and iron weighing less than 6 pounds per linear foot	Setting in place and securing 50 tons of steel and iron weighing 6 pounds or more per linear foot.	Furnishing, preparing and applying 200 sq. yds. of roofing or skin of Portland cement mortar, 4-in. thick.	Furnishing, preparing and applying 100 sq. yds. of water-proof coating of pitch or asphalt	Preparing and applying to structures 4,000 sq. yds. of tarred felt, pitch, etc.	Furnishing, etc., 30 sq. yds. of granolithic side-walk, with lights, complete.	Cutting out and removing floors, walls, etc. of present buildings, other than included in Item (b), and finishing in detail	Underpinning and supporting and protecting buildings, and for all other work and risks not covered by other items	TOTALS.	TIME NEEDED FOR COMPLETION	TOTALS, including Premium at \$20 per day, dating from Oct. 20, 1907. — Page 5. Specifications.
	a	b	c	c	d	e	e	e	f	f	g	h	i	j	j	k				
Chas. F. Hall, 73 Fairview Ave., Malden	\$5 60 11,200.00	\$0 50 650.00	\$10 75 8,600.00	\$16 00 640.00	\$0 90 135.00	\$20.00 200.00	\$1 40 98.00	\$0 50 35.00	\$0 90 18.00	\$12.00 300.00	\$16.50 825.00	\$0 50 100.00	\$0 45 45.00	\$0 30 1,200.00	\$18.00 540.00	\$3,400.00	\$4,800.00	\$32,786.00	Nov. 30, 1907	\$33,600.00
Falvey & Kelley, 15 Intervale Park, Dorchester	5 50 11,000.00	8 00 800.00	10 50 8,400.00	15 00 600.00	3 00 450.00	20.00 200.00	2 00 140.00	1 00 70.00	1 00 20.00	16.00 400.00	16.00 800.00	60 120.00	60 60.00	20 800.00	20.00 600.00	2,000.00	4,500.00	30,960.00	Nov. 10, 1907	31,380.00
Hugh Nawn Contracting Co., 82 Savin St., Roxbury	4 00 8,000.00	4 00 400.00	14 00 11,200.00	16 00 640.00	1 80 270.00	15 00 150.00	1 00 70.00	75 52.50	75 15.00	12.00 300.00	15.00 750.00	75 150.00	60 60.00	30 1,200.00	17.00 510.00	1,800.00	3,000.00	28,567.50	Dec. 31, 1907	30,007.50
John E. Palmer, 79 Journal Bldg., Boston	4 00 8,000.00	6 00 600.00	10 00 8,000.00	16 00 640.00	1 50 225.00	18 00 180.00	1 00 70.00	40 28.00	50 10.00	12.00 300.00	17.00 850.00	50 100.00	20 20.00	30 1,200.00	18.00 540.00	800.00	2,350.00	24,003.00	Nov. 1, 1907	24,243.00
Coughlan & Shields Co., 104 Hanover St., Boston	4 00 8,000.00	4 50 450.00	10 00 8,000.00	15 00 600.00	60 90.00	18 00 180.00	1 00 70.00	50 35.00	75 15.00	11.00 275.00	15.00 750.00	50 100.00	40 40.00	30 1,200.00	18.00 540.00	500.00	2,800.00	23,645.00	Nov. 1, 1907	23,885.00
Chas. R. Gow Co., 79 Milk St., Boston	4 00 8,000.00	5 00 500.00	10 00 8,000.00	15 00 600.00	90 135.00	15.00 150.00	1 00 70.00	50 35.00	50 10.00	12.00 300.00	15.00 750.00	40 80.00	35 35.00	30 1,200.00	18.00 540.00	500.00	2,900.00	22,905.00	Nov. 15, 1907	23,405.00
Patrick McGovern, 6 Beacon Street, Boston	4 25 8,500.00	8 00 800.00	10 50 8,400.00	12 00 480.00	80 120.00	20.00 200.00	1 00 70.00	15 10.50	20 4.00	10.00 250.00	14.00 700.00	50 100.00	25 25.00	25 1,000.00	16.00 480.00	250.00	1,900.00	23,280.50	Oct. 20, 1907	23,280.50

NOTE.—The contract was awarded to Patrick McGovern.

APPENDIX G.

WASHINGTON STREET TUNNEL.—CANVASS OF BIDS FOR FURNISHING STEEL AND IRON WORK FOR ENTRANCES AND EXIT AT SUMMER STREET.—BIDS OPENED AUG. 1, 1907.

BIDDERS AND ADDRESSES.					
	2,100 pounds 1½-in. steel tie-rods.	36,000 pounds structural steel.	225 pounds cast-iron.	TOTALS.	TIME NAMED FOR DELIVERY.
G. W. & F. Smith Iron Co., Gerard Street, Boston, ...	Price per pound. Amount. \$0. 04 84. 00	\$0. 04 1,440. 00	\$0. 04 9. 00	\$1,533. 00	Sept. 16, 1907
New England Structural Co., 110 State Street, Boston, ...	Price per pound. Amount. .035* 73. 50	.04 1,440. 00	.03 6. 75	1,520. 25	Sept. 16, 1907

*For 1½-inch iron rods.

NOTE.—The contract was awarded to New England Structural Co.



APPENDIX H.

WASHINGTON STREET TUNNEL.—CANVASS OF BIDS FOR CONSTRUCTING ENTRANCE AND EXIT AT WATER AND DEVONSHIRE STREETS.—BIDS OPENED AUGUST 15, 1907.

BIDDERS AND ADDRESSES.	60 cu. yds. Earth Excavation.	Removing and dispos- ing of 40 cu. yds. of masonry in cellar floors, walls, foundations, etc.	Furnishing, hauling and putting in place, for all purposes other than Item (ren.), 50 cu. yds. Portland concrete	Furnishing, hauling and putting in place, where shown on the contract plans, 10 cu. yds. Portland concrete	Furnishing and putting in place 60 sq. yds. of granolithic surface, 1 in. in depth.	Furnishing and laying 3 cu. yds. of Portland Brick Masonry.	Setting in place and securing 1 ton of steel and iron weighing less than 6 pounds per lin. ft.	Setting in place and securing 2½ tons of steel and iron weighing 6 pounds or more per lin. ft.	Furnishing, preparing and apply- ing 50 sq. yds. of coating, or skin, of Portland cement mortar, ¾ in. thick.	Furnishing, preparing and apply- ing 10 sq. yds. of waterproof coating of pitch or asphalt.	Preparing and apply- ing to struc- tures 200 sq. yds. of tarred felt, pitch, etc.	Furnishing, etc. 9 sq. yds. of granolithic side-walk, with lights, complete.	Cutting out and remov- ing floors, walls, etc., of present building, other than included in Item (b), and finish- ing in de- tail.	Underpin- ning and supporting and pro- tecting buildings, and for all other work and risks not covered by other items.	Furnishing, hauling and putting in place 8 cu. yds. of cin- der con- crete, 1 part Portland cement, 3 parts sand, 8 parts cinders	TOTALS.	TIME NAMED FOR COMPLETION.
	a	b	cn	cen	4c	d	f	ff	g	h	i	j	jj	k	m		
Charles F. Hall, 17 Milk St., Boston.	\$5.50 330.00	\$7.00 280.00	\$12.50 625.00	\$16.00 160.00	\$1.25 75.00	\$20.00 60.00	\$12.00 12.00	\$15.00 37.50	\$0.60 30.00	\$0.50 5.00	\$0.40 80.00	\$20.00 180.00	\$350.00	\$530.00	\$11.00 88.00	\$2,842.50	Oct. 15, 1907
John E. Palmer, 29 Journal Bldg., Boston.	5.00 300.00	8.00 320.00	13.50 675.00	16.00 160.00	1.50 90.00	20.00 60.00	15.00 15.00	18.00 45.00	.50 25.00	.30 3.00	.30 60.00	20.00 180.00	250.00	550.00	10.00 80.00	2,813.00	Oct. 10, 1907
Coughlan & Sheils Co., 104 Hanover St., Boston.	5.00 300.00	7.00 280.00	11.00 550.00	16.00 160.00	1.00 60.00	20.00 60.00	20.00 20.00	20.00 50.00	.50 25.00	.50 5.00	.50 100.00	20.00 180.00	300.00	500.00	12.00 96.00	2,686.00	Sept. 15, 1907

NOTE.—The contract was awarded to Coughlan & Sheils Co.

APPENDIX I.

WASHINGTON STREET TUNNEL.—CANVASS OF BIDS FOR ENAMELED AND CERAMIC MOSAIC TILING IN BOYLSTON, ESSEX,
WINTER AND SUMMER STATIONS.—BIDS OPENED AUGUST, 1907.

BIDDERS AND ADDRESSES.	Setting in Portland cement mortar half-ribbed terra-cotta tile backing with brick base; tiles and brick furnished by the Commission.	Furnishing and setting, in Portland cement mortar, 3" x 6" x 1" straight and curved white enameled tiles, and work in connection therewith.	Furnishing and setting on walls and coves, in Portland cement mortar, 1" x 3" x 1" white ceramic mosaic tiles, including colored borders, signs, etc.	Furnishing and setting, on ceilings, in Portland cement mortar, 1" x 1" x 1" ceramic mosaic tiles.	Furnishing and setting, in Portland cement mortar, ceramic angle-pieces in connection with ceramic mosaic tile work.	Furnishing and setting, in Portland cement mortar, 3" x 4" x 1" green ceramic mosaic tiles for sanitary base about 10 in. deep.	TOTALS.
BOYLSTON AND ESSEX STATIONS.							
	(a) 1,500 sq. yds.	(b) 1,100 sq. yds.	(c) 1,000 sq. yds.	(d) 1,600 sq. yds.	(e) 3,000 lin. ft.	(f) 190 sq. yds.	
Boston Tile & Mantel Co., 120 Boylston Street, Boston..	\$0.58 \$70.00	\$4.69 5,159.00	\$5.44 5,440.00	..	..	\$5.71 1,084.90	
Wm. H. Smith, 9A Park Street, Boston.....	.54 \$10.00	4.73 5,203.00	4.73 4,730.00	\$5.58 8,928.00	\$0.20 600.00	8.10 1,539.00	\$21,800.00*
PARTS OF WINTER AND SUMMER STATIONS.							
	(a) 1,600 sq. yds.	(b) 1,400 sq. yds.	..	..	..	(c) 150 sq. yds.	
Wm. H. Smith, 9A Park Street, Boston.....	\$0.54 \$64.00	\$4.73 6,622.00	..	..	..	\$8.10 1,215.00	\$8,701.00
Boston Tile & Mantel Co., 120 Boylston Street, Boston..	.58 928.00	4.69 6,566.00	..	..	..	5.71 \$56.50	\$8,350.50*
PARTS OF WINTER AND SUMMER STATIONS.							
	..	..	(a) 1,000 sq. yds.	(b) 1,500 sq. yds.	..	..	
Murdock Shaw Co., 125 Federal Street, Boston...	..	..	\$4.63 4,630.00	\$5.70 8,550.00	..	..	13,180.00*
Wm. H. Smith, 9A Park Street, Boston.....	..	..	4.73 4,730.00	5.58 8,370.00	..	..	13,100.00

* Contracts awarded.

APPENDIX J.

WASHINGTON STREET TUNNEL.—CANVASS OF BIDS FOR BUILDING STATION STAIRWAYS FROM WASHINGTON AND UNION STREETS.
BIDS OPENED SEPTEMBER 3, 1907.

BIDDERS AND ADDRESSES.	Furnishing, hauling and putting in place in stairs, etc., 50 cu. yds. Portland cement concrete.	Furnishing and putting in place 250 sq. yds. of granolithic surface, 1 in. in depth.	Setting in place and securing 5 tons of steel and iron weighing less than 6 lbs. per lin. foot.	Furnishing all material for and constructing 65 sq. yds. of granolithic sidewalk, with lights.	TOTALS.	TIME NAMED FOR COMPLETION.
	Item (ccn).	Item (4c).	Item (f).	Item (j).		
Simpson Bros. Corpn., 166 Devonshire St., Boston.....	\$53.00 2,650.00	\$1.20 300.00	\$30.00 150.00	..	\$3,100.00*	October 10, 1907
Aberthaw Constrn. Co., 8 Beacon St., Boston.....	29.00 1,450.00	1.36. 340.00	12.00 60.00	\$23.00 1,495.00	3,345.00	October 19, 1907
W. A. Murtfeldt Co., 161 Devonshire St., Boston.....	12.00 600.00	1.10 275.00	25.00 125.00	22.50 1,462.50	2,462.50	30 days.

* Exclusive of Item (j).

NOTE.—The contract was awarded to W. A. Murtfeldt Co.

APPENDIX K.

WASHINGTON STREET TUNNEL.—CANVASS OF BIDS FOR CONSTRUCTING ENTRANCES AND EXIT AT SUMMER STREET.—BIDS OPENED SEPTEMBER 5, 1907.

BIDDERS AND ADDRESSES.	9000 cu. yds. Earth Excavation.	Removing and dispos- ing of 100 cu. yds. of masonry in foundations, etc., other than (bb).	Removing and dispos- ing of 15 cu. yds. of concrete masonry from tunnel structure and from underpinning of piers of building.	Furnishing, hauling and putting in place, for all pur- poses other than Item (ccn), 400 cu. yds. of Portland cement concrete.	Furnishing, hauling and putting in place, where shown on the contract plans, 50 cu. yds. of Portland cement concrete.	Furnishing and putting in place 230 sq. yds. of grano- lithic sur- face, 1 in. in depth.	Furnishing and laying 20 cu. yds. of Portland cement brickwork.	Laying 10 lin. ft. of 6 in. and 8 in. vitrified pipe, fur- nished by the Com- mission.	Laying 30 lin. ft. of 10 in. and 12 in. vitrified pipe, fur- nished by the Com- mission.	Setting in place and securing 15 tons of steel and iron weighing less than 6 pounds or more per linear foot.	Setting in place and securing 33 tons of steel and iron weighing 6 pounds or more per linear foot.	Setting in place, and jointing with Portland cement mortar, 80 lin. ft. of granite curb- ing, fur- nished by the Com- mission.	Furnishing, preparing and apply- ing 300 sq. yds. of coating, or skin, of Portland cement mortar, $\frac{1}{4}$ in. thick.	Furnishing, preparing and apply- ing 100 sq. yds. of waterproof coating of pitch or asphalt.	Preparing and apply- ing to struc- tures 2,000 sq. yds. of tarred felt, pitch, etc.	Furnishing, etc., 50 sq. yds. of granolithic sidewalks, with lights, complete.	Cutting out and re- moving floors, walls, etc., of present building, other than included in Items (b) and (bb), and finish- ing in detail.	Underpin- ning and supporting and pro- tecting buildings; moving boiler; and for all work and risks not other- wise covered.	TOTALS.	TIME NAMED FOR COMPLETION.	TOTALS including Premium at \$20 per day, dating from Nov- 15, 1907. (See page 5, Specifica- tions.)
	a	b	bb	cn	ccn	4c	d	e	ee	f	ff	3f	g	h	i	j	jj	k			
Coughlan & Sheils Co., 104 Hanover St., Boston.	\$5.00 4,500.00	\$7.00 700.00	\$18.00 270.00	\$11.00 4,400.00	\$16.00 800.00	\$1.25 287.50	\$20.00 400.00	\$1.00 10.00	\$2.00 80.00	\$12.00 180.00	\$20.00 660.00	\$0.30 24.00	\$0.50 150.00	\$0.50 50.00	\$0.40 800.00	\$30.00 1,500.00	\$900.00	\$2,000.00	\$17,711.50	Three months.	\$18,811.50
Chas. R. Gow Co., 79 Milk St., Boston.	4.50 4,050.00	4.50 450.00	20.00 300.00	11.00 4,400.00	16.00 800.00	1.00 230.00	12.00 240.00	.25 2.50	.50 20.00	12.00 180.00	12.00 396.00	1.00 80.00	.40 120.00	.50 50.00	.20 400.00	16.00 800.00	500.00	1,500.00	14,518.50	Dec. 10, 1907	15,018.50
John E. Palmer, 79 Journal Bldg., Boston.	3.80 3,420.00	6.00 600.00	25.00 375.00	10.00 4,000.00	15.00 750.00	1.00 230.00	18.00 360.00	.50 5.00	1.00 40.00	12.00 180.00	16.00 528.00	.50 40.00	.50 150.00	.30 30.00	.25 500.00	19.00 950.00	600.00	1,200.00	13,958.00	Dec. 1, 1907	14,278.00
Patrick McGovern, 6 Beacon St., Boston.	4.50 4,050.00	5.00 500.00	15.00 225.00	10.00 4,000.00	14.00 700.00	.75 172.50	18.00 360.00	.75 7.50	1.00 40.00	8.00 120.00	12.00 396.00	.25 20.00	.30 90.00	.25 25.00	.20 400.00	18.00 900.00	300.00	1,800.00	14,106.00	Nov. 15, 1907	14,106.00

NOTE.—The contract was awarded to Patrick McGovern.

APPENDIX L.

WASHINGTON STREET TUNNEL.—CANVASS OF BIDS FOR FURNISHING STEEL
REQUIRED IN ENLARGEMENT OF SUBWAY AT HAYMARKET SQUARE.
BIDS OPENED SEPTEMBER 24, 1907.

BIDDERS AND ADDRESSES.		40,000 pounds of structural steel.
Boston Bridge Works (Inc.), 47 Winter Street, Boston.....	Price per pound.	\$.0402
	Amount.	\$1,608.00
Harrington, Robinson & Co., 272 Franklin Street, Boston.....	Price per pound.	.0395
	Amount.	1,580.00*
Eastern Bridge & Structural Co., Station A, Worcester.....	Price per pound.	.0395
	Amount.	1,580.00

* Deliveries to be 6 or 7 weeks from signing of contract; bonus and premium clauses stricken out.

NOTE.—The contract was awarded to Eastern Bridge & Structural Co.

APPENDIX M.

WASHINGTON STREET TUNNEL.—CANVASS OF BIDS FOR PAVING OVER OR NEAR THE TUNNEL IN FRANKLIN, WASHINGTON, DEVONSHIRE, UNION AND ELM STREETS, AND IN ADAMS SQUARE.—BIDS OPENED OCTOBER 1, 1907.

BIDDERS AND ADDRESSES.	Taking up and relaying 2,000 sq. yds. granite block pav- ing, with pitch and pebble. joints.	Furnishing and putting in place 2,000 sq. yds. con- crete base, 6 in. thick.	Taking up and relaying 60 sq. yds. granite block paving, with gravel joints.	Taking up and relaying 80 sq. yds. granite flag- ging, with pitch and pebble joints.	Re-setting 70 lin. ft. edgestone.	Taking up and relaying 60 sq. yds. brick side- walk.	TOTALS.
	a	b	c	d	e	f	
Wm. J. Rafferty & Co., 7 Water Street, Boston.....	\$1.90 3,800.00	\$1.42 2,840.00	\$0.65 39.00	\$1.90 152.00	\$0.21 14.70	\$0.50 30.00	\$6,875.70
Coleman Bros., 15 Court Square, Boston.....	1.50 3,000.00	1.10 2,200.00	.75 45.00	1.00 80.00	.30 21.00	.50 30.00	5,376.00
D. J. Kiley, 95 Milk Street, Boston.....	1.25 2,500.00	1.15 2,300.00	.60 36.00	1.25 100.00	.25 17.50	.30 18.00	4,971.50
Coughlan & Sheils Co., 104 Hanover St. Boston.....	1.28 2,560.00	1.05 2,100.00	.60 36.00	1.28 102.40	.18 12.60	.28 16.80	4,827.80
John T. Shea, Jr., 696 E. Sixth St., So. Boston....	1.00 2,000.00	.85 1,700.00	.50 30.00	1.00 80.00	.20 14.00	.29 17.40	3,841.40

NOTE.—The contract was awarded to John T. Shea, Jr.

APPENDIX N.

WASHINGTON STREET TUNNEL.—CANVASS OF BIDS FOR BUILDING PART OF NEW WESTERLY WALL, ROOF AND INVERT FOR ENLARGEMENT OF SUBWAY, HAYMARKET SQUARE. BIDS OPENED OCTOBER 3, 1907.

BIDDERS AND ADDRESSES.	4,000 cu. yds. Earth Excavation.	Removing and dispos- ing of 350 cu. yds. of masonry, walls, foundations, etc., from the Sub- way struc- ture.	Furnishing, hauling and putting in place 900 cu. yds. of concrete made with Portland cement mortar.	Furnishing, hauling and putting in place 150 cu. yds. of concrete made with Portland cement mortar.	Furnishing, hauling and putting in place 150 cu. yds. of concrete made with Portland cement mortar.	Furnishing and laying 20 cu. yds. of Portland brick masonry.	Laying 30 lin. ft. of 4-inch, 6- inch and 8- inch vitri- fied pipe.	Laying 100 lin. ft. of 10- inch and 12- inch vitri- fied pipe.	Setting in place and securing 30 tons of steel and iron weighing less than 6 pounds per lin. ft.	Setting in place and securing 50 tons of steel and iron weighing 6 pounds or more per lin. ft.	Furnishing, preparing and apply- ing \$50 sq. yds. of coating, or skin, of Portland cement mortar, 1- inch thick.	Furnishing, preparing and apply- ing 300 sq. yds. of waterproof coating, 1- inch thick, of pitch.	Preparing and apply- ing to struc- tures 8,000 sq. yds. of tarred felt, pitch, etc., in layers.	Supporting and pro- tecting buildings, etc., and all other work and risks not covered by other items.	TOTALS.	TIME NAMED FOR COMPLETION
	a	bb	cc	ccn	3c	d	e	ee	f	ff	g	h	i	k		
W. A. Murtfeldt Co., 161 Devonshire St., Boston ...	\$6.50 26,000.00	\$26.00 9,100.00	\$13.50 12,150.00	\$15.00 2,250.00	\$13.50 2,025.00	\$18.00 360.00	\$0.75 22.50	\$1.00 100.00	\$18.00 540.00	\$22.00 1,100.00	\$0.50 400.00	\$0.30 90.00	\$0.24 1,920.00	\$3,000.00	\$59,057.50	Mar. 31, 1908
Falvey & Kelly, 15 Intervale Pk., Dorchester...	4.50 18,000.00	20.00 7,000.00	11.00 9,900.00	14.00 2,100.00	9.00 1,350.00	20.00 400.00	1.00 30.00	1.00 100.00	15.00 450.00	20.00 1,000.00	.60 480.00	.60 180.00	.20 1,600.00	1,000.00	43,590.00	Feb. 1, 1908
John E. Palmer, 79 Journal Bldg., Boston.....	4.70 18,800.00	16.00 5,600.00	10.00 9,000.00	15.00 2,250.00	7.50 1,125.00	20.00 400.00	.50 15.00	.80 80.00	12.00 360.00	15.00 750.00	.50 400.00	.30 90.00	.25 2,000.00	100.00	40,970.00	Feb. 1, 1908
Peter J. Herr, Jr., 443 W. Broadway, So. Boston.	4.15 16,600.00	17.00 5,950.00	9.25 8,325.00	13.50 2,025.00	9.00 1,350.00	20.00 400.00	1.00 30.00	2.00 200.00	14.00 420.00	20.00 1,000.00	.40 320.00	.40 120.00	.20 1,600.00	..	38,340.00	Feb. 1, 1908
Coleman Bros., 15 Court Sq., Boston.....	4.00 16,000.00	12.00 4,200.00	10.00 9,000.00	14.00 2,100.00	10.00 1,500.00	20.00 400.00	.50 15.00	.75 75.00	20.00 600.00	20.00 1,000.00	.50 400.00	1.00 300.00	.15 1,200.00	1,000.00	37,790.00	Jan. 15, 1908
Chas. R. Gow Co., 79 Milk St., Boston ..	4.25 17,000.00	12.00 4,200.00	10.00 9,000.00	13.00 1,950.00	6.50 975.00	18.00 360.00	.75 22.50	1.00 100.00	11.00 330.00	15.00 750.00	.30 240.00	.30 90.00	.20 1,600.00	100.00	36,717.50	Mar. 1, 1908
Hugh Nawn Contracting Co., 82 Savin St., Roxbury....	4.00 16,000.00	10.00 3,500.00	10.00 9,000.00	14.00 2,100.00	5.00 750.00	18.00 360.00	1.00 30.00	1.00 100.00	10.00 300.00	14.00 700.00	.50 400.00	.30 90.00	.25 2,000.00	500.00	35,830.00	Jan. 15, 1908
Patriek McGovern, 6 Beacon St., Boston.....	4.25 17,000.00	9.00 3,150.00	9.75 8,775.00	11.00 1,650.00	9.00 1,350.00	20.00 400.00	.25 7.50	.50 50.00	11.00 330.00	12.00 600.00	.40 320.00	.30 90.00	.25 2,000.00	1.00	35,723.50	Feb. 15, 1908
Coughlan & Sheils Co., 104 Hanover St., Boston	3.60 14,400.00	8.90 3,115.00	9.75 8,775.00	14.00 2,100.00	6.25 937.50	17.00 340.00	.50 15.00	.60 60.00	10.75 322.50	14.50 725.00	.50 400.00	.50 150.00	.25 2,000.00	500.00	33,840.00	Dec. 24, 1907

NOTE.—The contract was awarded to Coughlan & Sheils Co.

APPENDIX O.

WASHINGTON STREET TUNNEL.—CANVASS OF BIDS FOR BUILDING OPEN INCLINE NORTH OF THE BOSTON CITY HOSPITAL RELIEF STATION, NEAR CANAL STREET.—BIDS OPENED OCTOBER 31, 1907.

BIDDERS AND ADDRESSES.	4,600 cu. yds. Earth Excavation.	Removing and disposing of 600 cu. yds. of concrete and granite masonry from the Subway structure.	Leaving, if required, 150 cu. yds. of the granite masonry included in Item (bb) at the disposal of the Commission.	Furnishing, hauling and putting in place 1,300 cu. yds. of concrete made with Portland cement mortar.	Furnishing and laying 30 cu. yds. of Portland brick masonry.	Resettling in Portland cement mortar, 170 lin. ft. of 2 ft. x 2 ft. granite coping removed from Subway structure.	Setting in place and securing 22 tons of steel and iron weighing less than 6 pounds per lin. ft.	Furnishing, preparing and applying 200 sq. yds. of coating, or skin, of Portland cement mortar, ½ in. thick.	Furnishing, preparing and applying 250 sq. yds. of waterproof coating, ½ in. thick, of pitch.	Preparing and applying to structures 4,500 sq. yds. of tarred felt, pitch, etc., in layers.	Applying 300 sq. yds. of crude paraffine to the heads of piles in place.	600 cu. yds. of good clean gravel not found in excavating under Item (a), but furnished and used for filling.	25,000 lin. ft. of spruce piles, driven, stripped where coming in contact with masonry, and cut off.	TOTALS.	TIME NAMED FOR COMPLETION.
	a	bb	3b	ea	d	dd	f	g	h	i	l	n	s		
Bruno & Petitti, 23 Court Street, Boston.....	\$3.00 13,800.00	\$10.00 6,000.00	\$2.00 300.00	\$12.00 15,600.00	\$20.00 400.00	\$2.00 340.00	\$20.00 440.00	\$0.50 100.00	\$0.40 100.00	\$0.40 1,800.00	\$0.30 90.00	\$2.00 1,200.00	\$0.30 7,500.00	\$47,670.00	July 1, 1908
John E. Palmer, 79 Journal Bldg., Boston	2.90 13,340.00	15.00 9,000.00	1.00 150.00	9.50 12,350.00	18.00 360.00	2.00 340.00	12.00 264.00	.50 100.00	.20 50.00	.25 1,125.00	.30 90.00	2.00 1,200.00	.18 4,500.00	42,869.00	Feb. 20, 1908
Coughlan & Sheils Co., 104 Hanover St., Boston.....	2.50 11,500.00	9.50 5,700.00	1.00 150.00	9.75 12,675.00	15.00 300.00	.50 85.00	10.00 220.00	.50 100.00	.30 75.00	.20 900.00	.05 15.00	1.25 750.00	.18 4,500.00	36,970.00	Feb. 15, 1908
Cavanagh Bros., 471 Dorchester Ave., So. Boston,	2.00 9,200.00	10.00 6,000.00	2.00 300.00	8.00 10,400.00	20.00 400.00	2.00 340.00	15.00 330.00	1.00 200.00	2.00 500.00	.15 675.00	1.50 450.00	2.00 1,200.00	.16 4,000.00	33,995.00	Feb. 1, 1908
Hugh Nawn Contracting Co., 82 Savin Street, Roxbury.....	2.00 9,200.00	4.00 2,400.00	2.00 300.00	10.00 13,000.00	18.00 360.00	2.00 340.00	8.00 176.00	.50 100.00	.50 125.00	.25 1,125.00	.10 30.00	1.75 1,050.00	.18 4,500.00	32,706.00	Feb. 1, 1908
Coleman Bros., 15 Court Square, Boston.....	1.75 8,050.00	8.00 4,800.00	2.00 300.00	8.50 11,050.00	16.00 320.00	1.00 170.00	15.00 330.00	.50 100.00	1.00 250.00	.15 675.00	.50 150.00	1.25 750.00	.16 4,000.00	30,945.00	Jan. 15, 1908
Patrick McGovern, 6 Beacon St., Boston.....	1.55 7,130.00	8.00 4,800.00	1.00 150.00	8.25 10,725.00	20.00 400.00	1.50 255.00	7.00 154.00	.35 70.00	.40 100.00	.20 900.00	.20 60.00	1.50 900.00	.17 4,250.00	29,804.00	Feb. 10, 1908
Chas. R. Gow Co., 79 Milk Street, Boston.....	1.35 6,210.00	8.00 4,800.00	1.00 150.00	8.00 10,400.00	16.00 320.00	1.00 170.00	8.00 176.00	.30 60.00	.40 100.00	.15 675.00	.20 60.00	1.50 900.00	.15 3,750.00	27,771.00	Feb. 1, 1908

NOTE.—The contract was awarded to Chas. R. Gow Co.

APPENDIX P.

WASHINGTON STREET TUNNEL.—CANVASS OF BIDS FOR CONCRETE STAIRWAYS AND LANDINGS, WITH GRANOLITHIC SURFACE, AT THE LAGRANGE STREET, ESSEX STREET, TEMPLE PLACE AND FRANKLIN STREET ENTRANCES.—BIDS, OPENED DECEMBER 5, 1907.

BIDDERS AND ADDRESSES.	45 cu. yds. concrete base.	500 sq. yds. granolithic, 1" thick.	TOTALS.	TIME NAMED FOR COMPLETION.
	(ccn)	4c		
Simpson Bros. Corp., 166 Devonshire St., Boston....	\$25.00 1,125.00	\$1.50 750.00	\$1,875.00	Jan. 15, 1908
Thos. J. Hind, 19 Milk St., Boston.....	16.00 720.00	2.25 1,125.00	1,845.00	Jan. 10, 1908.
Aberthaw Constr. Co., 8 Beacon St., Boston.....	22.00 990.00	1.26 630.00	1,620.00	Dec. 30, 1907.
W. A. Murtfeldt Co., 161 Devonshire St., Boston....	17.45 785.25	1.10 550.00	1,335.25	12 working days.
Coleman Bros., 15 Court Sq., Boston.....	10.00 450.00	.80 400.00	850.00	16 days.

NOTE.—The contract was awarded to Coleman Bros.

APPENDIX Q.

WASHINGTON STREET TUNNEL.—CANVASS OF BIDS FOR CONSTRUCTING
VENTILATING DUCT AND ENCASING TIE-RODS.—BIDS OPENED DE-
CEMBER 10, 1907.

BIDDERS AND ADDRESSES.	300 lin. ft. of ventilat- ing duct.	Encasing 117 Tie-rods.	TOTALS.
W. A. Murtfeldt Co., 161 Devonshire St., Boston...	\$2,603.00	\$1,110.00	\$3,713.00
Aberthaw Construction Co., 8 Beacon St., Boston.....	6.42 1,926.00	7.74 905.58	2,831.58
Coleman Bros., 15 Court Sq., Boston.....	2,225.00	825.00	3,050.00
John E. Palmer, Old South Bldg., Boston.....	1,680.00	700.00	2,380.00

NOTE.—The contract was awarded to John E. Palmer.

APPENDIX R.

WASHINGTON STREET TUNNEL.—CANVASS OF BIDS FOR CONCRETE AND GRANOLITHIC PLATFORMS, LANDINGS AND PASSAGEWAY FLOORS OF STATIONS BETWEEN LA GRANGE STREET AND HAYMARKET SQUARE.—BIDS OPENED DECEMBER 24, 1907.

BIDDERS AND ADDRESSES.	Furnishing and putting in place 750 cu. yds. concrete masonry for base, 2 inches or more in depth.	Furnishing and putting in place 9,200 sq. yds. granolithic wearing surface 1 inch in depth.	Setting in place and securing 2 tons $\frac{3}{4}$ in. square twisted steel rods, furnished by the Commission.	Furnishing and putting in place 170 reinforced granolithic covers, 12 in. x 7 $\frac{1}{2}$ in., over drains.	TOTALS.	1.—Number of days from beginning of work (within 7 days after award of contract) named by Bidders for completion of platforms, etc., in or connected with stations named below: 2.—Number of stations in which Bidders propose to carry on work simultaneously:							
	a	b	c	d		Boylston.	Essex.	Winter.	Summer.	Milk.	State.	Union-Friend.	
Coughlan & Sheils Co., 104 Hanover St., Boston.....	\$11.50 8,625.00	\$0.95 8,740.00	\$7.00 14.00	\$0.50 85.00	\$17,464.00	1 2	25	26	24	33 All.	26	38	40
Thos. J. Hind, 19 Milk St., Boston.....	10.00 7,500.00	1.03 9,476.00	12.50 25.00	 100.00	17,101.00	1 2	10	12	10	13 Two.	12	13	13
John F. Gill Co., Winter Hill, Mass.....	9.00 6,750.00	.90 8,280.00	20.00 40.00	1.00 170.00	15,240.00	1 2	8	8	8	8 Two.	8	8	8
W. A. Murtfeldt Co., 161 Devonshire St., Boston....	9.50 7,125.00	.85 7,820.00	20.00 40.00	1.00 170.00	15,155.00	1 2	10	12	10	15 Two or Four.	12	15	16
Peter F. Connolly, 70 Perkins St., Jamaica Plain....	8.74 6,555.00	.89 8,188.00	12.50 25.00	1.01 171.70	14,939.70	1 2	9	9	9	9 Two.	9	9	12
Frank Williams Co., 19 Willard St., Boston.....	8.00 6,000.00	.72 6,624.00	 1,665.00	 170.00	14,459.00	1 2	5	5	5	5 Three.	6	6	6
Aberthaw Construction Co., 8 Beacon St., Boston.....	8.60 6,450.00	.81 7,452.00	15.00 30.00	.75 127.50	14,059.50	1 2	15	15	15	16 Two.	15	20	20
Simpson Bros. Corp., 166 Devonshire St., Boston....	7.49 5,617.50	.729 6,706.80	20.00 40.00	1.00 170.00	12,534.30	1 2	11	12	11	15 Three. /	12	14	18
Chas. R. Gow Co., 79 Milk St., Boston.....	10.00 7,500.00	.50 4,600.00	25.00 50.00	1.50 255.00	12,405.00	1 2	12	14	12	16 One.	14	16	21
Coleman Bros., 15 Court Sq., Boston.....	8.40 6,300.00	.53 4,876.00	15.00 30.00	.20 34.00	11,240.00	1 2	7	7	7	8 Two.	7	8	10

NOTE.—The contract was awarded to Coleman Bros.

APPENDIX S.

WASHINGTON STREET TUNNEL.—CANVASS OF BIDS FOR BUILDING FOUR CONCRETE AND GRANOLITHIC STAIRWAYS IN STATE STATION.—BIDS OPENED JANUARY 14, 1908.

BIDDERS AND ADDRESSES.	1—Central.	2—Southerly.	3—Store Room.	4—Boiler Room.	TOTALS.	TIME NAMED FOR COMPLETION.
Aberthaw Construction Co., 8 Beacon St., Boston.....	\$731.00	\$300.00	\$175.00	\$152.00	\$1,358.00	Feb. 17, 1908.
Simpson Bros. Corporation, 166 Devonshire St., Boston.....	675.20	307.25	128.50	133.15	1,244.10	Feb 8, 1908.
W. A. Murtfeldt Co., 161 Devonshire St., Boston.....	448.50	146.12	88.90	112.40	795.92	Feb. 1, 1908.
John E. Palmer, 1012 Old South Bldg., Boston....	400.00	150.00	90.00	130.00	770.00	Mar. 1, 1908.
Coleman Bros., 15 Court Sq., Boston.....	350.00	125.00	65.00	78.00	618.00	7 days from beginning work.
Frank Williams & Bro., 19 Willard St., Boston.....	250.00	100.00	50.00	50.00	450.00	Feb. 1, 1908.

NOTE.—The contract was awarded to Coleman Bros.

APPENDIX T.

WASHINGTON STREET TUNNEL.—CANVASS OF BIDS FOR ENAMELED AND CERAMIC MOSAIC TILING IN MILK, STATE AND UNION-FRIEND STATIONS. BIDS OPENED JANUARY 28, 1908.

BIDDERS AND ADDRESSES.	Setting in Portland cement mortar, on vertical walls, half-ribbed terracotta tile backing with brick base; tiles and brick furnished by Commission.	Setting in Portland cement mortar, on overhanging walls, half-ribbed terracotta tile backing, the tiles furnished by Commission.	Plastering with Portland cement mortar on concrete wall or ribbed tiling surface, not exceeding 2" thick.	Plastering with Portland cement mortar on concrete wall or ribbed tiling surface to a thickness of more than 2" but not exceeding 1 1/2".	Furnishing and setting in Portland cement mortar 3" x 6" x 1/2" white ceramic tiles and work in connection therewith.	Furnishing and setting on walls and ceilings (incl. curved work overhang more than 45") in Portland cement mortar, 3" x 6" x 1/2" white ceramic mosaic tile.	Furnishing and setting on ceilings (incl. curved work overhang more than 45") in Portland cement mortar, 3" x 6" x 1/2" white ceramic mosaic tile.	Furnishing and setting in Portland cement mortar white or colored ceramic mosaic pieces, additional to prices for Items (c) and (d).	Furnishing and setting in Portland cement mortar borders and name signs in blue and white 3" x 4" x 1/2" ceramic mosaic tiles.	Furnishing and setting in Portland cement mortar borders and name signs in green and white 3" x 4" x 1/2" ceramic mosaic tiles.	Furnishing and setting in Portland cement mortar sanitary base (10 horizontal courses) of 3" x 3" x 1/2" green ceramic mosaic tiles, incl. brick or concrete supports.	Furnishing and setting 2 courses of ceramic mosaic tiles, in colors to match borders, forming 30" x 46" recesses for advertising panels.	TOTALS.
MILK STATION.													
	(a) 800 sq. yds.	(aa) 300 sq. yds.	(b) 1,000 sq. yds.	(bb) 100 sq. yds.	(c) 600 sq. yds.	(d) 500 sq. yds.	(e) 300 sq. yds.	(f) 800 lin. ft.		(h) 70 sq. yds.	(i) 75 sq. yds.	(j) 50 panels.	
Murdock-Shaw Co., 125 Federal St., Boston.....	\$0.67 536.00	\$1.75 525.00	\$0.70 700.00	\$1.26 126.00	\$5.57 3,342.00	\$4.65 2,325.00	\$5.97 1,791.00	\$0.21 168.00		\$9.50 665.00	\$9.10 682.50	\$3.37 168.50	\$11,029.00
Wm. H. Smith, 9 Park St., Boston.....	.63 504.00	1.50 450.00	.72 720.00	1.22 122.00	5.53 3,318.00	4.70 2,350.00	5.90 1,770.00	.22† 180.00		10.00 700.00	0.50 712.50	3.00 150.00	10,976.50
The C. M. Tyler Co., 120 Boylston St., Boston..	.61 488.00	1.55 465.00	.73 730.00	1.30 130.00	5.49 3,294.00	4.71 2,355.00	6.07 1,821.00	.19 152.00		10.25 717.50	8.47 635.25	3.00 150.00	10,937.75*
STATE STATION.													
	(a) 2,000 sq. yds.	(aa) 100 sq. yds.	(b) 2,400 sq. yds.	(bb) 250 sq. yds.	(c) 600 sq. yds.	(d) 1,300 sq. yds.	(e) 1,800 sq. yds.	(f) 2,000 lin. ft.		(h) 60 sq. yds.	(i) 65 sq. yds.	(j) 75 panels.	
The C. M. Tyler Co., 120 Boylston St., Boston..	\$0.61 1,220.00	\$1.55 155.00	\$0.73 1,752.00	\$1.30 325.00	\$5.49 3,294.00	\$4.71 6,123.00	\$6.07 10,926.00	\$0.19 380.00		\$10.25 615.00	\$8.47 550.55	\$3.00 225.00	25,565.55
Murdock-Shaw Co., 125 Federal St., Boston.....	.67 1,340.00	1.75 175.00	.70 1,680.00	1.26 315.00	5.57 3,342.00	4.65 6,045.00	5.97 10,746.00	.21 420.00		9.50 570.00	9.10 591.50	3.37 252.75	25,477.25
Wm. H. Smith, 9 Park St., Boston.....	.63 1,260.00	1.50 150.00	.72 1,728.00	1.22 305.00	5.53 3,318.00	4.70 6,110.00	5.90 10,620.00	.22† 450.00		10.00 600.00	0.50 617.50	3.00 225.00	25,383.50*
UNION-FRIEND STATION.													
	(a) 600 sq. yds.	(aa) 20 sq. yds.	(b) 900 sq. yds.	(bb) 100 sq. yds.	(c) 400 sq. yds.	(d) 400 sq. yds.	(e) 1,600 sq. yds.	(f) 1,600 lin. ft.		(g) 55 sq. yds.	(h) 63 sq. yds.	(i) 70 panels.	
The C. M. Tyler Co., 120 Boylston St., Boston..	\$0.61 366.00	\$1.55 31.00	\$0.73 657.00	\$1.30 130.00	\$5.49 2,196.00	\$4.71 1,884.00	\$6.07 9,712.00	\$0.19 304.00		\$10.25 563.75	\$8.47 533.61	\$3.00 210.00	16,587.30
Murdock-Shaw Co., 125 Federal St., Boston.....	.67† 402.00	1.75 35.00	.70 630.00	1.26 126.00	5.57 2,228.00	4.65 1,860.00	5.97† 9,552.00	.21 336.00		9.50 522.50	9.10 573.30	3.37 235.90	16,500.70†
Wm. H. Smith, 9 Park St., Boston.....	.63 378.00	1.50 30.00	.72 648.00	1.22 122.00	5.53 2,212.00	4.70 1,880.00	5.90 9,440.00	.22† 360.00		10.00 550.00	0.50 598.50	3.00 210.00	16,428.50

* Contracts awarded.

† Union-Friend contract awarded at \$16,412.70, the prices for Items (a) and (e) being reduced to \$0.63 and \$5.94 respectively.

APPENDIX U.

WASHINGTON STREET TUNNEL.—CANVASS OF BIDS FOR PLASTERING SUB-PASSAGE AT WINTER-SUMMER STATION.—BIDS OPENED FEBRUARY 8, 1908.

BIDDERS AND ADDRESSES.	200 sq. yds. plastering.	250 lin. ft. base.	TOTALS.
The Allan McIntosh Co., 166 Devonshire St., Boston.....	\$0.80 160.00	\$0.35 87.50	\$247.50
Boston Tile & Mantel Co., 120 Boylston St., Boston.....	.85 170.00	50.20 .00	220.00

NOTE.—The contract was awarded to Boston Tile & Mantel Co.

APPENDIX V.

WASHINGTON STREET TUNNEL.—CANVASS OF BIDS FOR FURNISHING
TWELVE 20-INCH OPEN-HEARTH STEEL I-BEAMS, WEIGHING 20,000
POUNDS, MORE OR LESS.—BIDS OPENED FEBRUARY 21, 1908.

BIDDERS AND ADDRESSES.		F. O. B. cars, Boston.	Delivered at Yard, 75 Canal St., Boston.
Harrington, Robinson & Co., 272 Franklin St., Boston.....	Price per pound.	....	2.06 cents.
	Amount.	....	\$412.00
Carnegie Steel Co., 125 Milk St., Boston.....	Price per pound.	2.01 cents.	2.0475 cents.
	Amount.	\$402.00	409.50
H. W. Hayes, Agent, Cambria Steel Co., 101 Tremont St., Boston.....	Price per pound.	1.98 cents.	2.03 cents.*
	Amount.	396.00	406.00

* Contract awarded.

APPENDIX W.

WASHINGTON STREET TUNNEL.—CANVASS OF BIDS FOR MARBLE
 DIRECTORY PANELS FOR STATION ENTRANCES.—BIDS OPENED
 MARCH 2, 1908.

BIDDERS AND ADDRESSES.	18 Directory Panels of "Blanco F." Marble, in- cluding Dogs and Anchors, and setting in place.	DELIVERY.
Bowker-Torrey Co., 118 Portland St., Boston.....	\$2,100.00	One in 3 weeks; rest at least 10 days later.
Chas. E. Hall Co., 62 First St., East Cambridge.	1,400.00	One in 10 days; rest in a month.
Troy Bros. & Co., 87 Haverhill St., Boston.....	950.00	.....
Philip H. Butler & Co., 25 Haverhill St., Boston.....	924.44	Part in 1 week; rest in 3 to 4 weeks.
Torrey-Johnson Marble Co., 78 Wareham St., Boston.....	875.00	One in 3 days; all in 30 working days.

NOTE.—The contract was awarded to Torrey-Johnson Marble Co.

APPENDIX X.

WASHINGTON STREET TUNNEL.—CANVASS OF BIDS FOR PLASTERING IN VARIOUS PARTS WITH MORTAR COMPOSED OF 1 PART PORTLAND CEMENT AND 2 PARTS SAND.—BIDS OPENED MARCH 5, 1908.

100

BOSTON TRANSIT COMMISSION.

BIDDERS AND ADDRESSES.	Class A.			Class B.	Class C.	Class D.	Class E.	Class F.
	Fine plastering on beams or ceilings, as good as roof over La Grange-St. Lobby.	Extra for square corners.	Extra for rounded corners.	Pebbled church finish on beams or ceilings; as good as Old Sta. Hq. Ticket-office lobby, E. B. Tunnel.	Plastering under side arches or flat ceilings; as good as arch above rods, Milk Station, O.S. entrance.	Plastering walls about $\frac{1}{2}$ in. thick, following surface; as good as wall opposite platform of Summer Station.	Plastering walls to true plane surface, pebbled or smooth three-coat work; as good as subpassageway between Winter and Summer stations.	Plastering cement sanitary base; as good as base in subpassageway between Winter and Summer stations.
	Per sq. yd.	Per lin. ft.	Per lin. ft.	Per sq. yd., incl. corners.	Per sq. yd.	Per sq. yd.	Per sq. yd.	Per lin. foot.
F. G. Crowley, 8 Province Court, Boston.....	\$1.25	\$0.10	\$0.10	\$0.90	\$0.80	\$0.75	\$1.10	\$0.25
Muir Brothers, 24 Milk St., Boston.....	.75	.10	.15	1.15	.75	.80	1.20 smooth 1.00 pebble	.25
The Allan McIntosh Co., 166 Devonshire St., Boston....	1.00	.05	.05	.75 +.05 per lin. ft. for corners.	1.00	.60	.80	.30
The C. M. Tyler Co., 120 Boylston St., Boston.....	.76	.07	.07	.82	.74	.97	.70	.26

APPENDIX Y.

WASHINGTON STREET TUNNEL. — CANVASS OF BIDS FOR FURNISHING BRASS MOULDINGS AROUND ADVERTISING PANELS.
BIDS OPENED MARCH 10, 1908.

BIDDERS AND ADDRESSES.	500 brass mouldings for advertising panels, as good as sample in Winter Station.		
	Price each.	Amount.	Remarks.
William Hall & Co., 7 & 8 Dock Sq., Boston.....	\$4.00	\$2,000.00	Material, extruded metal, $\frac{1}{2}$ -inch thick; polished and lacquered on face of angle.
Murdock-Shaw Co., 125 Federal St., Boston.....	3.90	1,950.00	Frame of brass angle, $\frac{3}{4}$ " x $\frac{1}{2}$ " x $\frac{1}{8}$ "; polished face.—Price includes erecting.
Hennessey Brass Works, 54 High St., Boston.....	3.70	1,850.00	Polished on face and edge.
E. B. Badger & Sons Co., 63-75 Pitts St., Boston.....	3.39	1,695.00	.....

NOTE.—The contract was awarded to E. B. Badger & Sons Co.

APPENDIX Z.

WASHINGTON STREET TUNNEL.—CANVASS OF BIDS FOR RIBBED TILE,
DELIVERED AT ADAMS SQUARE ENTRANCE.—MARCH, 1908.

BIDDERS AND ADDRESSES.		9,000 sq. ft. of 2-in. terra-cotta ribbed tile.		
		Price per sq. ft.	Amount.	Delivery.
Waldo Bros., 102 Milk Street, Boston.....		\$.0475	\$427.50	
Wm. H. Smith, 9 Park Street, Boston.....		.0375	337.50	One week.
National Fireproofing Co., 840-842 Old So. Bldg., Boston..		.0375	337.50	Immediate.

NOTE.—The contract was awarded to National Fireproofing Co.

APPENDIX AA.

WASHINGTON STREET TUNNEL.—CANVASS OF BIDS FOR BUILDING EXTENSION OF SUB-PASSAGEWAY UNDER TRACKS AT TRAVERS STREET.—BIDS OPENED MARCH 26, 1908.

BIDDERS AND ADDRESSES.	250 cu. yds. Earth Excavation.	Removing and dispos- ing of 50 cu. yds. con- crete mason- ry, terra- cotta rib tile, glazed tile, grano- lithic sur- face, etc.	Furnishing, hauling and putting in place 100 cu. yds. of con- crete made with Port- land cement mortar.	Setting in place and securing 2 tons of steel and iron weighing less than 6 pounds per lin. ft.	Setting in place and securing 1½ tons of steel and iron weighing 6 pounds or more per lin. ft.	Removing from present structure and re-set- ting ½ ton of steel and iron weighing 6 pounds or more per lin. ft.	Furnishing, preparing and apply- ing 50 sq. yds. of coat- ing, or skin, of Portland cement mortar, ½- in. thick.	Furnishing, preparing and apply- ing 10 sq. yds. of waterproof coating, ½- in. thick, of pitch.	Preparing and apply- ing 1,000 sq. yds. of tarred felt, pitch, etc., in layers.	Furnishing and putting in place 50 sq. yds. of tar concrete on roof of passageway.	Applying 20 sq. yds. of paraffine to heads of piles in place.	1,500 lin. ft. of spruce piles driven, stripped where com- ing in con- tact with masonry, and cut off.	Supporting and pro- tecting struc- tures; re- moving and depositing old mate- rials; and all work and risks not covered by other items.	TOTALS.	TIME NAMED FOR COMPLETION.
	a	bb	cc	f	ff	3f	g	h	i	k	l	s	t		
John E. Palmer, 1012 Old So. Bldg., Boston.	\$2.40 600.00	\$8.00 400.00	\$9.50 950.00	\$12.00 24.00	\$16.00 24.00	\$12.00 9.00	\$0.50 25.00	\$1.00 10.00	\$0.20 200.00	\$2.00 100.00	\$0.30 6.00	\$0.30 450.00	\$185.00	\$2,983.00	May 10, 1908
Coughlan & Sheils Co., 104 Hanover St., Boston.	2.00 500.00	7.00 350.00	9.75 975.00	6.00 12.00	12.00 18.00	150.00 112.50	.50 25.00	.35 3.50	.30 300.00	1.25 62.50	.20 4.00	.28 420.00	100.00	2,882.50	Three Weeks.
Hugh Nawn Contracting Co., 82 Savin St., Roxbury.	2.50 625.00	6.00 300.00	8.00 800.00	10.00 20.00	10.00 15.00	20.00 15.00	1.50 75.00	.50 5.00	.10 100.00	1.00 50.00	.20 4.00	.25 375.00	50.00	2,434.00	Apr. 15, 1908

NOTE.—The contract was awarded to Hugh Nawn Contracting Co.

APPENDIX BB.

WASHINGTON STREET TUNNEL.—CANVASS OF BIDS FOR FURNISHING
WHITE PORTLAND CEMENT.—BIDS OPENED APRIL 5, 1908.

BIDDERS AND ADDRESSES.	80 bbls. White Portland Cement.
Vulcanite Portland Cement Co., Flat Iron Building, N. Y. City..	Berkshire "Snow White;" \$8.00 per bbl., f.o.b. N. Y., N. H. & H. tracks, Boston.
Waldo Bros., 102 Milk St., Boston.....	\$4.75 per bbl., delivered 75 Canal St., Boston. Cotton bags not return- able. Cement on hand. \$4.60 per bbl., f.o.b. cars Boston for 110 bbls. About 3 weeks for delivery.
Blanc Stainless Cement Co., 11 East 59th St., New York City	\$1.15 per bag of 95 pounds, f.o.b. cars Boston. 5 cents allowed for each duck bag returned in good condition. Delivery at once from works at Allentown, Pa.

APPENDIX CC.

WASHINGTON STREET TUNNEL.—CANVASS OF BIDS FOR BUILDING RE-INFORCED CONCRETE AND GRANOLITHIC STAIRWAYS IN THE STATE STREET (SOUTH) ENTRANCE.—BIDS OPENED APRIL 9, 1908.

BIDDERS AND ADDRESSES.	Building stairways, landings and platforms and setting safety treads, castings, etc.	TIME NAMED FOR COMPLETION.
W. Murtfeldt Co., 161 Devonshire Street, Boston.....	\$2,760.00	May 10, 1908
Aberthaw Construction Co., 8 Beacon Street, Boston.....	2,242.00	28 Days.
John E. Palmer, 1012 Old South Bldg., Boston.....	1,970.00	May 5, 1908
Coleman Bros., 15 Court Square, Boston.....	1,745.00	21 Days.

NOTE.—The contract was awarded to Coleman Bros.

APPENDIX DD.

WASHINGTON STREET TUNNEL.—CANVASS OF BIDS FOR FURNISHING AND
ERECTING CAST-IRON AND STEEL WORK IN COVERING OVER STAIRS
AT THE DEVONSHIRE STREET ENTRANCE.—BIDS OPENED APRIL 14,
1908.

BIDDERS AND ADDRESSES.	Furnishing and erecting unpainted cast-iron and structural steel work.
G. W. & F. Smith Iron Co., Gerard Street, Roxbury.....	\$1,875.00
A. B. Robbins Iron Co., Norfolk Downs, Quincy.....	1,554.00
Hecla Iron Works, 166 Devonshire Street, Boston.....	1,500.00
Chelmsford Foundry Co., 159 Devonshire Street, Boston.....	1,300.00

NOTE.—The contract was awarded to Chelmsford Foundry Co.

APPENDIX EE.

WASHINGTON STREET TUNNEL—CANVASS OF BIDS FOR FURNISHING STEEL AND IRON WORK FOR ENLARGEMENT OF SUBWAY IN HAYMARKET SQUARE AND UNDER RELIEF STATION.—BIDS OPENED APRIL 16, 1908.

BIDDERS AND ADDRESSES.		400,000 lbs. structural steel.	500 lbs. cast iron.	TOTALS.	TIME NAMED FOR DELIVERY.	
					1st Instalment.	2d Instalment.
Eastern Bridge & Structural Co., Station A, Worcester.....	Price per lb. Amount.	\$0.034 13,600.00	\$0.034 17.00	\$13,617.00	30 days.	60 days.
Fred A. Houdlette & Son, Inc., 93 Broad St., Boston.....	Price per lb. Amount.	.0325 13,000.00	.03 15.00	13,015.00	May 21, 1908	June 11, 1908
Pennsylvania Steel Co., 70 Kilby St., Boston.....	Price per lb. Amount.	.032 12,800.00	.05 25.00	12,825.00	June 30, 1908	July 15, 1908
Harrington, Robinson & Co., 276 Franklin St., Boston	Price per lb. Amount.	.032 12,800.00	.032 16.00	12,816.00	June 15, 1908	July 15, 1908
Phoenix Iron Co., 110 State St., Boston.....	Price per lb. Amount.	.0307 12,280.00	.0307 15.35	12,295.35	June 15, 1908	July 27, 1908
Boston Bridge Works, Inc., 47 Winter St., Boston.....	Price per lb. Amount.	.0305 12,200.00	.0325 16.25	12,216.25	June 20, 1908	July 18, 1908
H. W. Hayes & Co., 101 Tremont St., Boston.....	Price per lb. Amount.	.0294 11,760.00	.0325 16.25	11,776.25	2 months.	3 months.
H. P. Converse & Co., 88 Broad St., Boston.....	Price per lb. Amount.	.0291 11,640.00	.04 20.00	11,660.00	June 15, 1908	July 2, 1908
Lewis F. Shoemaker & Co., Harrison Bldg., Philadelphia.....	Price per lb. Amount.	.029 11,600.00	.035 17.50	11,617.50	July 15, 1908	July 31, 1908
Levering & Garrigues Co., Station A, Hartford, Conn.....	Price per lb. Amount.	.02865 11,460.00	.035 17.50	11,477.50	June 1, 1908	July 1, 1908
New England Structural Co., 110 State St., Boston.....	Price per lb. Amount.	.0285 11,400.00	.0285 14.25	11,414.25	May 29, 1908	June 30, 1908
American Bridge Co., 89 State St., Boston.....	Price per lb. Amount.	.0279 11,160.00	.0279 13.95	11,173.95	2 months.	3 months.

NOTE.—The contract was awarded to American Bridge Co.

APPENDIX FF.

WASHINGTON STREET TUNNEL.—CANVASS OF BIDS FOR LAYING GRANOLITHIC SIDEWALK AT WINTER AND WASHINGTON STREETS.—BIDS OPENED APRIL 23, 1908.

BIDDERS AND ADDRESSES.	Removing old sidewalk and sidewalk lights and laying 63 sq. yds. granolithic sidewalk and 4 sq. yds. reinforced self-supporting sidewalk. Materials, except steel reinforcing rods, furnished by Contractor.
Simpson Bros. Corporation, 166 Devonshire St., Boston.....	\$319.50
Warren Bros. Co., 93 Federal St., Boston.....	300.00
Thos. J. Hind, 19 Milk Street, Boston.....	254.00
W. A. Murtfeldt Co., 161 Devonshire St., Boston.....	190.00

NOTE.—The contract was awarded to W. A. Murtfeldt Co.

APPENDIX GG.

WASHINGTON STREET TUNNEL.—CANVASS OF BIDS FOR BUILDING
REINFORCED CONCRETE AND GRANOLITHIC STAIRWAY IN THE
STATE STREET (NORTH) ENTRANCE.—BIDS OPENED MAY 7, 1908.

BIDDERS AND ADDRESSES.	Building stairway, etc., with granolithic surface and setting safety treads and other steel work fur- nished by the Commis- sion.	TIME NAMED FOR COMPLETION.	TOTALS, in- cluding Premium at \$10.00 per day dating from May 24, 1908. (See page 9 of Specifica- tions.)
Aberthaw Construction Co., 8 ¹ / ₂ Beacon St., Boston.....	\$988.00	June 6, 1908	\$1,118.00
John E. Palmer, 1012 Old South Bldg., Boston...	880.00	June 1, 1908	960.00
W. A. Murtfeldt Co., 161 Devonshire St., Boston.....	794.00	May 25, 1908	804.00
Coleman Bros., 15 Court Square, Boston.....	800.00	May 24, 1908	800.00

NOTE.—The contract was awarded to Coleman Bros.

APPENDIX HH.

WASHINGTON STREET TUNNEL.—CANVASS OF BIDS FOR BUILDING REINFORCED CONCRETE WALL AND FOUNDATION PIERS UNDER THE BOSTON CITY HOSPITAL RELIEF STATION, FOR ENLARGEMENT OF SUBWAY.—BIDS OPENED MAY 7, 1908.

BIDDERS AND ADDRESSES.	650 cu. yds. earth excavation below the line of invert water-proofing.	550 cu. yds. earth excavation below the line of invert water-proofing.	Cutting out, removing and disposing of 100 cu. yds. of old masonry from footings of the Relief Station.	Removing and disposing of 10 cu. yds. of masonry of old canal wall, and boulders.	Furnishing, hauling and putting in place, below line of invert water-proofing, 220 cu. yds. of concrete, made with Portland cement mortar.	Furnishing, hauling and putting in place, for all purposes other than Item (c), 170 cu. yds. of concrete, made with Portland cement mortar.	Setting in place and securing 9 tons of steel and iron weighing less than 6 pounds per lin. ft.	Setting in place and securing 3 tons of steel and iron weighing 6 pounds or more per lin. ft.	Furnishing, preparing and applying 100 sq. yds. of coating, or skin, of Portland cement mortar, 1 in. thick.	Furnishing, preparing and applying 250 sq. yds. of waterproof coating, 1 in. thick, of patch.	Preparing and applying to structures 1,000 sq. yds. of tarred felt, pitch, etc., in layers.	Supporting and protecting walls, etc., of Relief Station, and for all other work and risks in this contract not covered by other items.	TOTALS.	TIME NAMED FOR COMPLETION.
	a	aa	b	bb	c	ca	f	ff	g	h	i	k		
John Cavanagh & Son Building Moving Co., 166 Devonshire St., Boston.....	\$42.54 27,654.25	\$9.60 5,280.00	\$19.00 1,900.00	\$30.00 300.00	\$16.16 3,555.20	\$22.57 3,836.90	\$25.00 225.00	\$40.00 120.00	\$1.50 150.00	\$1.00 250.00	\$0.30 300.00	\$2,000.00	\$45,371.35	Nov. 1, 1908
Peter W. Hill, 426 Old South Bldg., Boston.....	15.00 9,750.00	12.00 6,600.00	35.00 3,500.00	25.00 250.00	20.00 4,400.00	20.00 3,400.00	20.00 180.00	25.00 75.00	.75 75.00	.75 187.50	.25 250.00	2,500.00	31,167.50	Sept. 30, 1908
Falvey & Kelly, 15 Intervale Park, Dorchester.....	8.00 5,200.00	10.00 5,500.00	15.00 1,500.00	10.00 100.00	12.00 2,640.00	16.00 2,720.00	20.00 180.00	20.00 60.00	.60 60.00	.75 187.50	.25 250.00	1,400.00	19,797.50	July 15, 1908
Frank A. Foster, 34 School St., Boston.....	5.00 3,250.00	4.00 2,200.00	7.00 700.00	7.00 70.00	12.00 2,640.00	10.00 1,700.00	1.00 9.00	1.00 3.00	2.00 200.00	1.00 250.00	1.00 1,000.00	5,000.00	17,022.00	Sept. 1, 1908
Coleman Bros., 15 Court Square, Boston.....	6.00 3,900.00	6.00 3,300.00	15.00 1,500.00	10.00 100.00	12.00 2,640.00	15.00 2,550.00	20.00 180.00	25.00 75.00	.50 50.00	1.00 250.00	.25 250.00	1,500.00	16,295.00	July 25, 1908
Hugh Nawn Contracting Co., 82 Savin St., Roxbury.....	6.00 3,900.00	6.00 3,300.00	12.00 1,200.00	15.00 150.00	15.00 3,300.00	15.00 2,550.00	8.00 72.00	25.00 75.00	.40 40.00	.50 125.00	.20 200.00	700.00	15,612.00	Aug. 1, 1908
Coughlan & Sheils Co., 104 Hanover St., Boston.....	6.50 4,225.00	5.75 3,162.50	12.00 1,200.00	15.00 150.00	12.00 2,640.00	14.00 2,380.00	12.00 108.00	18.00 54.00	.60 60.00	.60 150.00	.30 300.00	250.00	14,679.50	July 9, 1908
John E. Palmer, 1012 Old South Bldg., Boston.....	5.50 3,640.00	5.00 2,750.00	8.00 800.00	20.00 200.00	10.00 2,200.00	12.00 2,040.00	14.00 126.00	18.00 54.00	.50 50.00	.30 75.00	.20 200.00	500.00	12,635.00	July 25, 1908

NOTE.—The contract was awarded to John E. Palmer.

APPENDIX II.

WASHINGTON STREET TUNNEL.—CANVASS OF BIDS FOR FURNISHING
GRATINGS AND SCREENS.—BIDS OPENED MAY 13, 1908.

BIDDERS AND ADDRESSES.	One side- walk grating (Adams Square); one shaft grating and two screens (Milk Station).	TIME NAMED FOR DELIVERY.
G. W. & F. Smith Iron Company, Gerard Street, Roxbury.....	\$695.00	Three Weeks.
Oliver Whyte & Co., 17 Cornhill, Boston.....	683.50	....
Wright Wire Company, Worcester, Mass.....	450.00	Three Weeks.
A. B. Robbins Iron Company, Norfolk Downs, Quincy.....	370.00	Two Weeks.

NOTE.—The contract was awarded to A. B. Robbins Iron Co.

APPENDIX JJ.

WASHINGTON STREET TUNNEL.—CANVASS OF BIDS FOR FURNISHING
TWO BOSTWICK FOLDING GATES WITH FITTINGS, MILK STREET
ENTRANCE.—BIDS OPENED MAY 18, 1908.

BIDDERS AND ADDRESSES.	Two Bostwick Folding Gates, with Fittings, delivered at Milk St. Entrance.	TIME NAMED FOR DELIVERY.
Grecian Iron Works, 28 Tudor Street, Cambridge.....	\$185.00	....
A. B. Robbins Iron Company, Norfolk Downs, Quincy.....	96.00	Twenty Days.
W. A. Snow Iron Works (Inc.), 19 Portland Street, Boston.....	94.00	Three Weeks.
L. M. Ham & Co., 150 Portland Street, Boston.....	90.00	Two Weeks.
Wright Wire Company, Worcester.....	85.00	One Week.
The Morss & Whyte Company, 75 Cornhill, Boston.....	80.00	Two Weeks.
Oliver Whyte & Co., 17 Cornhill, Boston.....	70.00	Ten Days.

NOTE.—The contract was awarded to Oliver Whyte & Co.

APPENDIX KK.

WASHINGTON STREET TUNNEL.—CANVASS OF BIDS FOR FURNISHING
THREE BOSTWICK FOLDING GATES.—BIDS OPENED JUNE 8, 1908.

BIDDERS AND ADDRESSES.	Furnishing and Delivering three Bostwick Gates, two to Milk Station Entrance and one to the Adams Square Entrance.	TIME NAMED FOR DELIVERY.
W. A. Snow Iron Works (Inc.), 19 Portland Street, Boston.....	\$288.00	....
Oliver Whyte & Co., 17 Cornhill, Boston.....	195.00	....
A. B. Robbins Iron Co., Norfolk Downs, Quincy.....	192.00	Two Weeks.
Wright Wire Co., Worcester.....	160.00	....
L. M. Ham & Co., 150 Portland Street, Boston.....	150.00	Three Weeks.
The Morss & Whyte Co., 75 Cornhill, Boston.....	150.00	June 26, 1908

NOTE.—The contract was awarded to The Morss & Whyte Co.

APPENDIX LL.

WASHINGTON STREET TUNNEL.—CANVASS OF BIDS FOR FURNISHING
AND INSTALLING 13 STEEL AND CAST-IRON GRILLES FOR EN-
TRANCES AND EXITS.—BIDS OPENED JUNE 9, 1908.

BIDDERS AND ADDRESSES.	Lump Price.	TIME NAMED FOR COMPLETION.
Wright Wire Co., Worcester.....	\$2,885.00	Ten Weeks.
Chelmsford Foundry Co., Medford.....	2,106.00	Eight Weeks.
Oliver Whyte & Co., 17 Cornhill, Boston.....	1,800.00	Eight Weeks.
G. W. & F. Smith Iron Co., Gerard Street, Roxbury.....	1,228.00	Two Months.
The Morss & Whyte Co., 75 Cornhill, Boston.....	950.00	Ten Weeks.

NOTE.—The contract was awarded to G. W. & F. Smith Iron Co.

APPENDIX MM.

WASHINGTON STREET TUNNEL.—CANVASS OF BIDS FOR FURNISHING AND INSTALLING IN STATIONS COPPER-COVERED DOORS, WINDOWS, ETC.—BIDS OPENED JUNE 9, 1908.

BIDDERS AND ADDRESSES.	3 copper-covered Dutch doors and frames, Type A, with transom.	3 copper-covered Dutch doors and frames, Type A, without transom.	9 copper-covered doors and frames, Type E, with transom.	21 copper-covered doors and frames, Type B, without transom.	25 copper-covered doors and frames, Type G, with glazed panel.	12 copper-covered doors and frames, Type C, without glazed panel.	29 pairs copper-covered telephone booth doors, and frames, Type D.	29 copper-covered double-glazed hollow telephone doors, and frames, Type G.	7 checking room windows and frames, including setting marble shelf furnished by the Commission.	6 6x6 windows for switch-board rooms.	TOTALS, Including Item 4.	TOTALS, Including Alternative Item 4½.	TIME NAMED FOR COMPLETION.
	1	1½	2	2½	3	3½	4	4½	5	6			
S. D. Hicks & Son, 17 Bowker St., Boston...	\$110.00 330.00	\$100.00 300.00	\$98.00 882.00	\$88.00 1,848.00	\$87.00 2,175.00	\$88.00 1,056.00	\$103.00 2,987.00	\$75.00 2,175.00	\$55.00 385.00	\$20.00 120.00	\$10,083.00	\$9,271.00	Oct, 1, 1908
Lombard & Tracy Co., 161 Devonshire St., Boston...	\$4.00 252.00	71.60 214.80	71.20 640.80	63.20 1,327.20	65.15 1,628.75	62.95 755.40	112.80 3,271.20	86.70 2,514.30	51.75 362.25	24.20 145.20	8,597.60	7,840.70	Six weeks after all accurate sizes of openings can be obtained.
John W. Rapp, College Point, Long Island, N. Y.	92.00 276.00	79.80 239.40	59.00 531.00	45.50 955.50	45.50 1,137.50	47.50 570.00	82.00 2,378.00	58.00 1,682.00	41.00 287.00	20.00 120.00	6,494.40 1,223.75	5,798.40 1,136.75	2½ months.
E. B. Badger & Sons Co., 63 Pitts St., Boston.....	82.00 246.00	74.00 222.00	88.00 792.00	81.00 1,701.00	59.00 1,475.00	56.00 672.00	78.00 2,262.00	60.00 1,740.00	29.00 203.00	12.00 72.00	7,645.00	7,123.00	About 3¼ months.
											Extra for Hardware	Extra for Hardware	
											7,718.15 TOTAL	6,935.15 TOTAL	

NOTE.—The contract was awarded to John W. Rapp

APPENDIX NN.

WASHINGTON STREET TUNNEL.—CANVASS OF BIDS FOR BUILDING CONCRETE AND GRANOLITHIC STAIRWAYS FOR THE WESTERLY EXTENSION OF TRAVERS STREET SUB-PASSAGEWAY.—JUNE, 1908.

BIDDERS AND ADDRESSES.	Building stairways, setting safety treads, laying granolithic floors, setting man-hole ring, and all incidental work.
Simpson Bros. Corporation, 166 Devonshire Street, Boston.....	\$304.00
Thomas J. Hind, 45 Commercial Wharf, Boston.....	298.00
Aberthaw Construction Co., 8 Beacon Street, Boston.....	289.00
Coleman Bros., 15 Court Square, Boston.....	191.00

NOTE.—The contract was awarded to Coleman Bros.

APPENDIX OO.

TUNNEL UNDER BEACON HILL. — CANVASS OF BIDS FOR 90-FT. TEST
BORING IN PINCKNEY STREET.—JUNE, 1908.

BIDDERS AND ADDRESSES.	90-ft. Boring, made with pipes not less than $4\frac{1}{2}$ " or more than 6" inside. Price to cover any kind of material encountered, taking samples, etc.	
B. F. Smith & Co., Inc., 38 Oliver Street, Boston	Price per lin. foot, Amount,	\$6.00 \$540.00
Healey Sewer Mach. & Constrn. Co., 15 Beacon Street, Boston.....	Price per lin. foot, Amount,	\$5.50 \$495.00

NOTE.—The contract was awarded to Healey Sewer Mach. & Constrn. Co.

